Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

DECEMBER 1959

UNIVERSITY MICROFILMS
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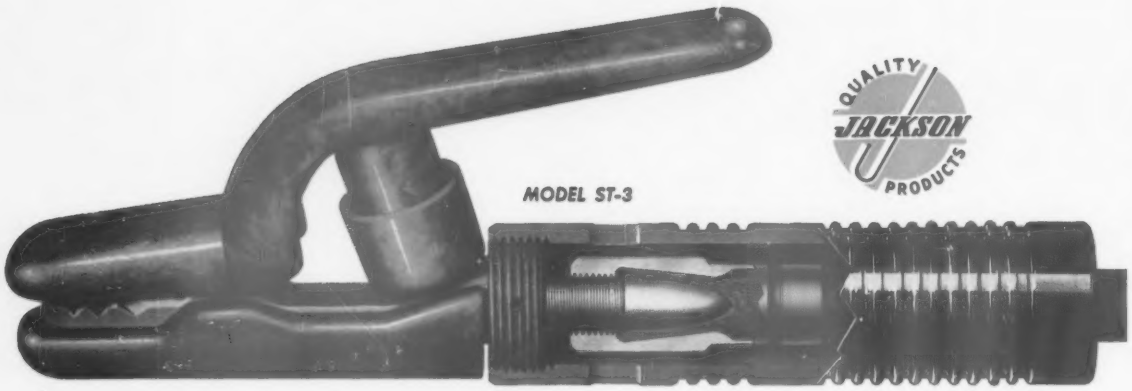
WIR

Redesigning for Automatic Welding

SHED BY THE INDUSTRIAL PUBLISHING CORPORATION

The magazine of welding management, production, and engineering



new . . .
Sealed Tight

JACKSON SERIES ST electrode holders offer a *Sealed Tight* mechanical cable connection that gives you practically one-piece conductivity between cable and holder. Tongs are of heat-treated 98% copper alloy.

The stripped cable strands are completely *Sealed Tight* within a *connection nut*, making all-around *tight* metal-to-metal contact with the holder tong, *sealed* against moisture and dirt. The cable jacket is also *Sealed Tight*. The connection nut, by providing an all-around *tight* support of the cable jacket, allows no strain on the cable strands which usually occurs through flexure and tension.

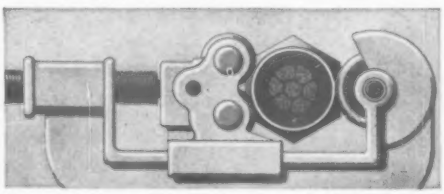
This cable connection is quick and lasting, requiring no maintenance during the normal life of copper or aluminum cable.

Large, ventilated handle threads onto a non-conductive asbestos bushing, has no direct metal contact with tong or cable connection, resulting in an extremely cool working holder.

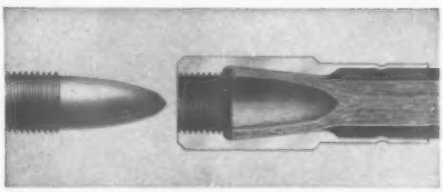
Should the "stinger end" of the holder require service of any kind, it may be quickly replaced without disturbing the actual cable connection. This important feature greatly reduces holder down-time and effects savings in cable cost.

Copper alloy lower jaw terminates in a point, silver-plated for greatest conductivity. When nut is tightened, cable strands are equally disposed around this point, *Sealed Tight*.

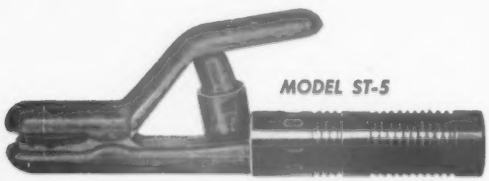
The nut extends backward, forming a ferrule around the cable jacket. This *Sealed Tight Connection Nut* is made in sizes to fit cables No. 1, 1/0, 2/0, and 3/0.



For a *truly permanent nut-to-cable connection*, the ferrule of the nut is crimped around the cable jacket, using Jackson's inexpensive, fast-acting crimping tool.



Detachable Stinger feature enables the operator to detach the "stinger end" by unscrewing it from the connection nut. The cable strands stay in place inside the nut.



Sold Everywhere by Better Welding Supply Dealers

MADE IN TWO SIZES . . .

Model ST-3, "Sealed Tight" Insulated Copper Alloy Holder Electrodes through ¼" • 300 Amps • 10" long

Model ST-5, "Sealed Tight" Insulated Copper Alloy Holder Electrodes through ⅜" • 500 Amps • 11½" long

Jackson Products

AIR REDUCTION SALES CO. A DIVISION OF AIR REDUCTION CO., INC.

WARREN • MICHIGAN

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Here's the most versatile combination anyone could ask for...

READ WHAT EXPERTS HAVE TO SAY ABOUT THE NEWEST HOBART—

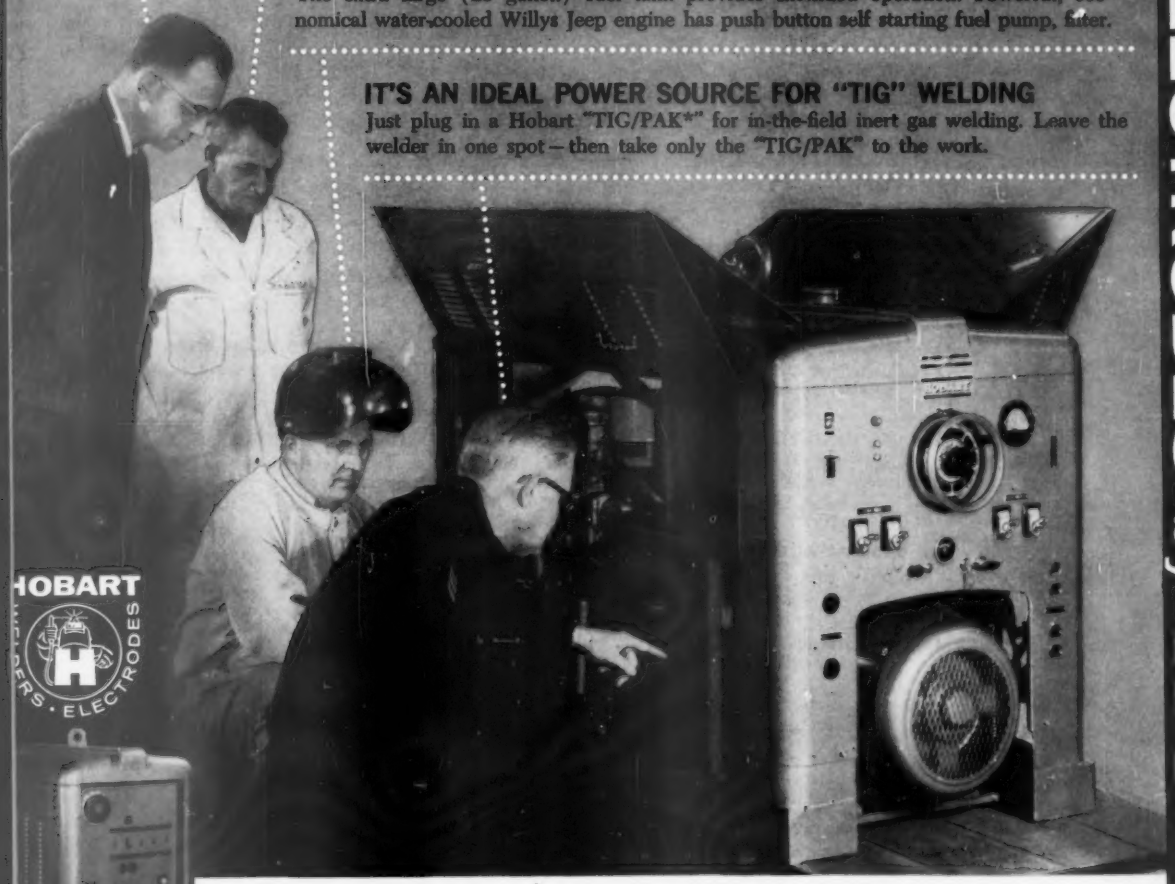
DC, AC welding + AC and DC power

100% DUTY CYCLE lets you weld all day using 250 amps. DC at 30 volts or 300 amps. AC at 30 volts. A wide welding range (30-275 amps. DC, 30-325 amps. AC) in 500 accurately controlled steps simplifies the operator's job—improves his efficiency—because he can pick the exact welding heat for every job.

NO SWITCHES OR ADJUSTMENTS NEEDED TO DRAW UP TO 3KW AC power while welding with either AC or DC current (up to 10 KW AC power is also available). The operator can use lights, tools, sprays, etc. and never have to leave his work—making him more productive by allowing him to use the right tools the instant he needs them.

WELD WITH DC OR AC FOR BEST RESULTS ON EVERY JOB The extra large (25 gallon) fuel tank provides extended operation. Powerful, economical water-cooled Willys Jeep engine has push button self starting fuel pump, filter.

IT'S AN IDEAL POWER SOURCE FOR "TIG" WELDING Just plug in a Hobart "TIG/PAK*" for in-the-field inert gas welding. Leave the welder in one spot—then take only the "TIG/PAK" to the work.



IT PAYS TO CHOOSE . . . IT PAYS TO USE

WELDERS · ELECTRODES by HOBART

*Model 1189 TIG/PAK

Here's the answer to the problem of getting best possible results from TIG welding *in any location*. The "TIG/PAK" can be carried, hoisted or trundled to the job, connected by only the usual welding cable to a welder. No expensive plumbing installation required.

HOBART BROTHERS CO., BOX HW-129, TROY, OHIO
Phone FE 2-1223 "Manufacturers of the world's most complete line of arc welding equipment"

HOBART BROTHERS CO., BOX HW-129, TROY, OHIO
Yes—I'd like to know more about ☐ The new Hobart "AC-DAC" Welder ☐ Model 1189 "TIG/PAK"
My work is _____

Name _____
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reader's guide to **Welding Design & Fabrication** *for December, 1959*

COVER: Redesigned joint in an earthmover rim eliminates all the shortcomings of previous joints. Now, high quality welds are made faster and more economically. This is just one example of how Firestone Steel Products Co., Akron, Ohio, uses the flexibility of welded design to improve existing products—and to diversify by adding new welded products to its line.

FEATURES

27 METAL WORKING FIRM DIVERSIFIES WITH NEW WELDED PRODUCTS
Welded design keeps the door to the future open for this metal working firm. It lets Firestone Steel Products diversify by adding more and more new products to its line.

28 HOW FIRESTONE DESIGNS AND WELDS EARTHMOVER RIMS
A new joint design has none of the shortcomings of previous joints. High quality welds are made faster and more economically.

30 U. S. WILL DESIGN 41,000 WELDED BRIDGES IN NEXT 15 YEARS
Marked trend toward welded steel design is evident as top prizes in Steel Highway Bridge Design competition go to all-welded structures.

32 TWO-PIECE CAST WELDMENT REPLACES ONE-PIECE CAST BASE
Cast-weld construction replaces one-piece cast bases which the foundry had trouble casting and delivering on time.

34 NEW ALUMINUM ALLOY IS DUCTILE AT —320°F
Designer now can specify a new, strong and ductile aluminum alloy for low temperature applications without fear of brittle fracture.

41 MULTI-SPOT WELDERS TURN OUT 3,000 BRITISH ECONOMY CARS EACH WEEK
Specialized resistance welding equipment has special locating and holding fixtures and air-operated ejectors to insure speed and accuracy of welding.

42 USE ON-THE-JOB HEAT TREATING IN REPAIRING BRITTLE STAINLESS VALVES
High pressure steam valves of Type 347 stainless had to be repaired because welds had become brittle. Induction heat treating restored ductility, permitted quality repair welds to be made.

44 SPECIAL AUTOMATIC SET-UPS SPEED WELDING OF 78-INCH PIPE
Special set-ups help this company meet delivery deadlines and make welds that meet specifications of the American Water Works Association and the ASME.

46 VACUUM BRAZING SOLVES STAINLESS OXIDATION PROBLEM
New equipment speeds production of honeycomb panels; look for its use on other oxygen-sensitive materials such as titanium, molybdenum and beryllium.

52 SWITCH TO AUTOMATIC WELDING BOOSTS PRODUCTION 400 PERCENT
Mechanized inert-gas consumable-electrode process speeds welding of aluminum components for aircraft and missiles.

60 ELECTRO-BRAZING SYSTEM FOR SOLID OR STRANDED COPPER WIRE
A double clamp jig with carbon electrodes gets the best wire brazes ever because of firm clamping and a follow-up action that brings wire end together as solder pellet melts.

DEPARTMENTS

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World's champion corn picker welded with M&T Murex ELECTRODES

In the past eight years, five championships have been won by farmers using the New Idea corn picker. It is also the world's biggest selling brand. For the kind of welds that contribute to championship performance year after year, the New Idea Division of Avco Distributing Corporation depends on M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

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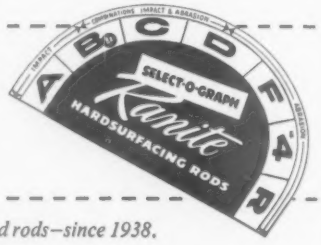
PRODUCTS FOR BETTER WELDING

Ranite Hardsurfacing Rods are So Easy to Use they've earned the title, "The Weldor's Rod"

NINE ADVANTAGES combine to make Ranite metallic-coated rods easiest to use:

1. Operation is equally good on AC and DC machines.
2. Application is practical in *all positions* – including vertical and overhead!
3. Arc is very quiet and stable.
4. Loss from splatter is eliminated.
5. There is no slag to remove.
6. Clear welding vision is maintained.
7. Arc can be re-struck instantly, if broken, because of metallic coating.
8. Rapid deposition rate gets the work done fast.
9. Latitude is very broad–just five Ranite rods–A, BX, C, D and No. 4–handle the *great majority* of all jobs–makes selection quick and easy! (Other Ranite rods available to meet every requirement.)

GET FREE Ranite Select-O-Graph Guide—shirt pocket size—shows best rod to meet any wear condition. Ask your Ranite representative or write direct.



Originators and pioneers of metallic-coated rods–since 1938.

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WELDORS' NO. 1 CHOICE FOR HARDSURFACING

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World's thirstiest flood pumps welded with M&T Murex
ELECTRODES

Some of the biggest pumps in the world are controlling flood damage in Florida's Lake Okeechobee area. With intake pipes 12 feet in diameter, they suck up swimming pool sized gulps of flood waters every second, spew it out into a series of reservoirs. Though not yet complete, the system has already prevented an estimated $44-million damage. The thirteen Fairbanks-Morse pumps in use were welded with M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING

Here, in one compact bulletin, is the information that can help you choose the right cylinders for transporting and distributing all types of high-pressure gases—including oxygen, nitrogen, argon, ethylene and carbon dioxide.

Here, too, are related the facts that show why *deep drawn* high-pressure gas cylinders are most likely to save you money on shipping charges, handling costs and maintenance.

Complete data are given—showing styles, sizes, capacities of cylinders, and ICC specifications which Hackney cylinders far exceed.

Whether you serve industrial or medical customers, you ought to have this new bulletin handy as a guide to quality and as an aid in ordering your Hackney cylinders.

mail the coupon today!

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Milwaukee 14, Wisconsin

Gentlemen: Please send the new bulletin at once. We are interested in facts and prices of Hackney high-pressure gas cylinders for ☐ industrial, ☐ medical service; in quantities 1 to 24 ☐, 25 to 99 ☐, 100 to 499 ☐, 500 to 999 ☐, 1000 or more ☐.

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WELDING MANAGEMENT

watches these developments

THE WORLD'S FIRST *titanium-clad pressure vessel of commercial size has proved a complete success according to S. C. Hamilton, vice president-sales, Chicago Bridge & Iron Company. The structure was built early this year for a West Coast petrochemical firm and has now withstood many months of strenuous service. Simultaneously, Hamilton announced that CB&I is now prepared to build titanium Hortonclad vessels on a commercial basis. (Complete details next month.)*

QUALIFIED DISTRIBUTORS of welding equipment and supplies for Linde Company, Division of Union Carbide Corp., are taking on new and increased responsibility for products and processes previously available only from the manufacturer. New lines offered through distributor channels include Oxweld oxy-acetylene welding and cutting apparatus, Sigma apparatus for inert gas shielded metal arc welding and Unionmelt equipment and supplies for submerged arc welding.

For the present, Linde will continue to furnish and service Unionarc welding equipment and supplies, highly specialized oxy-acetylene equipment and pilot arc starting for Sigma spot welding, on a direct manufacturer-to-user basis.

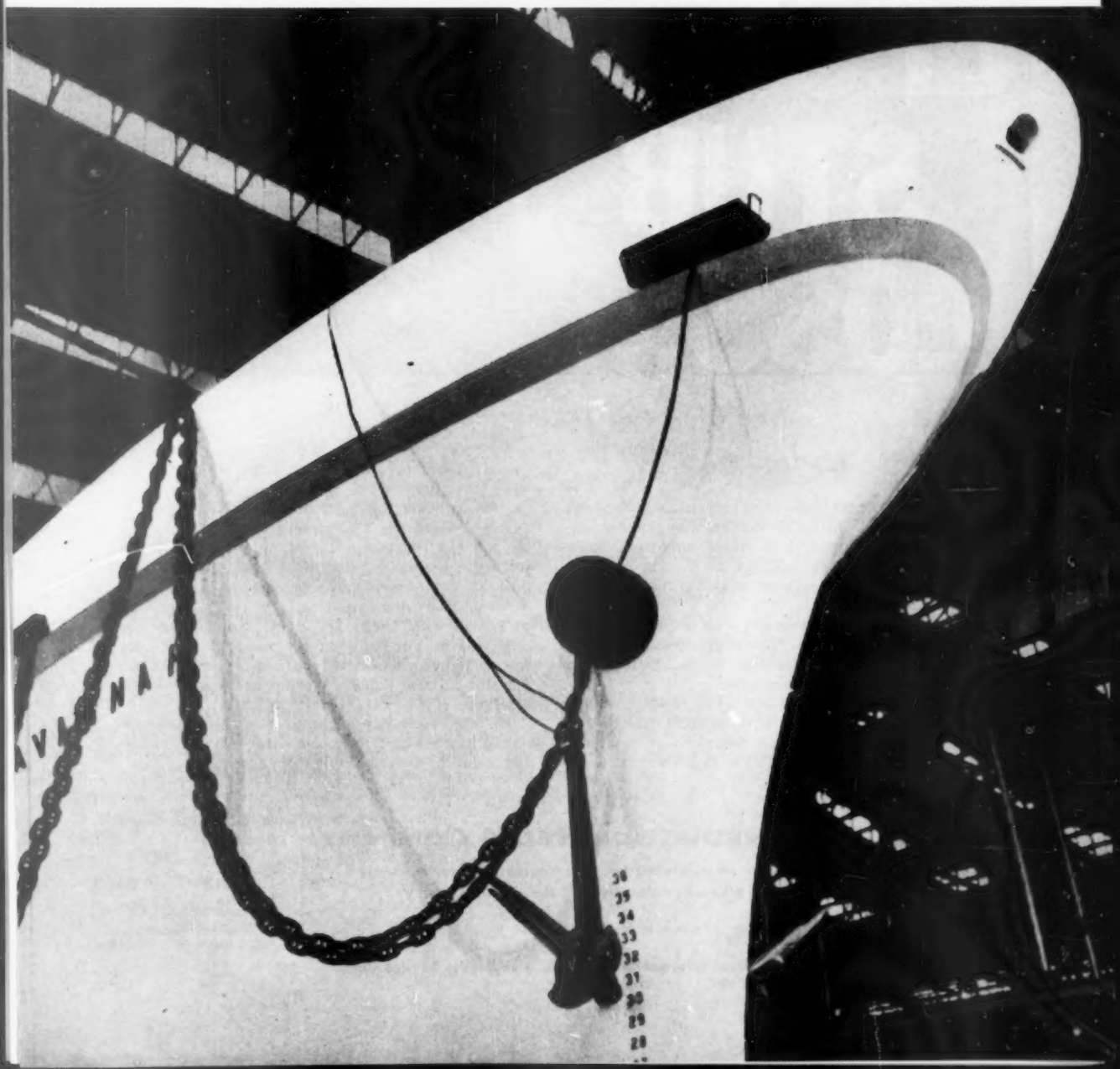
THE SUCCESS *of the all-welded economy cars brings an announcement from Ford Motor Company that a second economy car will be produced. Named the Comet, the car will be sold by Mercury dealers beginning with spring selling season. According to Henry Ford II, the Comet will go to the market place in the spring of* 1960 *as the aristocrat of the economy cars. (See pages* 42-44 *of* WELDING DESIGN & FABRICATION, *November,* 1959, *for a report on how Ford's Falcon and Dodge's Dart are welded.)*

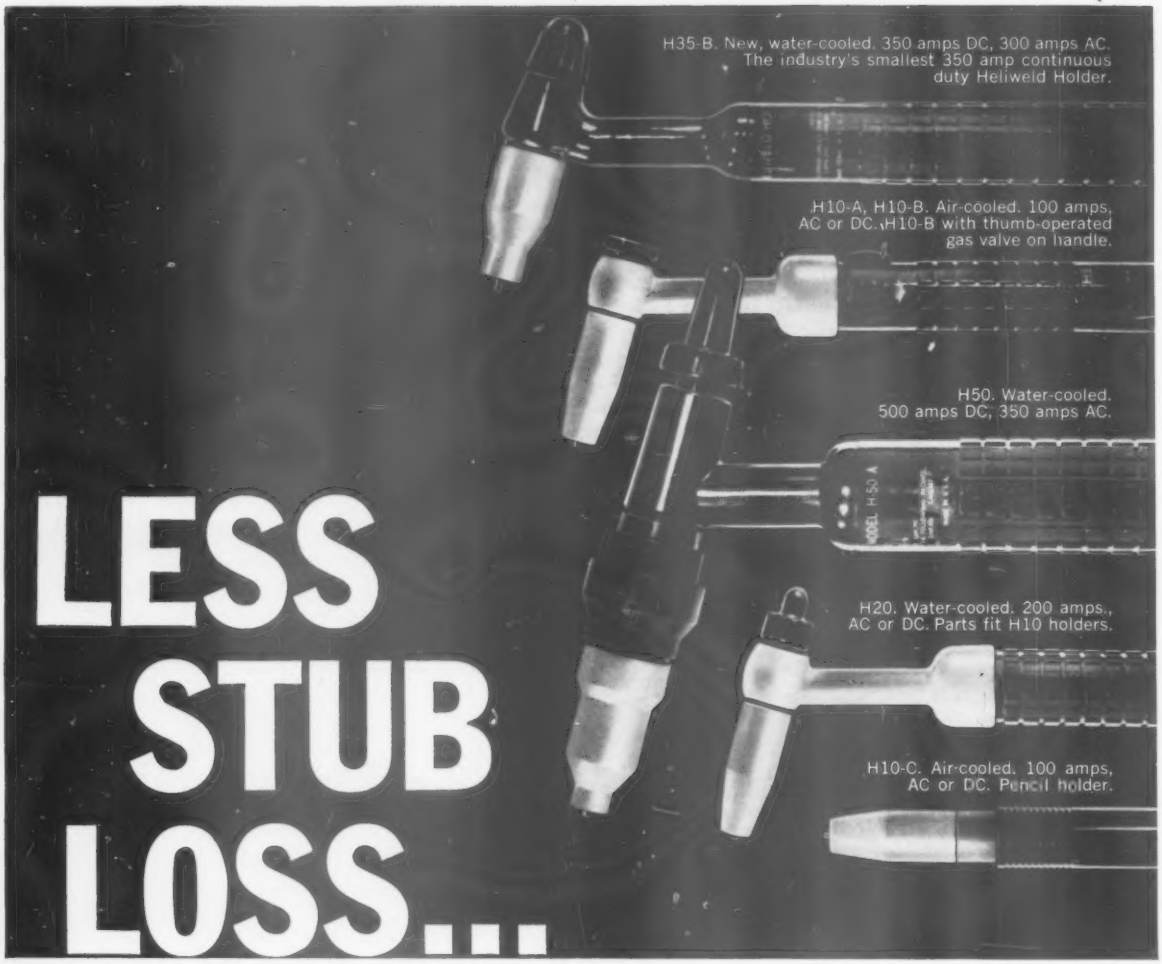
Circle No. 43 on Reader Service Card. ⟶

World's first atomic cargo ship relies on M&T Murex ELECTRODES

The N.S. Savannah, world's first nuclear-powered merchant vessel, is designed to prove the feasibility of "Atoms for Peace." Scheduled for initial service in the summer of 1960, she will cruise at 21 knots with a cargo of 10,000 tons, a 110-man crew and 60 passengers. In constructing the safety container for the atomic reactor, heart of the vessel's power system, the New York Shipbuilding Corp. relied upon Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING




H35-B. New, water-cooled. 350 amps DC, 300 amps AC. The industry's smallest 350 amp continuous duty Heliweld Holder.
H10-A, H10-B. Air-cooled. 100 amps, AC or DC. H10-B with thumb-operated gas valve on handle.
H50. Water-cooled. 500 amps DC, 350 amps AC.
H20. Water-cooled. 200 amps., AC or DC. Parts fit H10 holders.
H10-C. Air-cooled. 100 amps, AC or DC. Pencil holder.
LESS STUB LOSS...

one of 4 big reasons why you'll go for these AIRCO Heliweld Holders

1. LESS ELECTRODE LOSS—You can reduce stub losses as much as 50% when Heliwelding thin gauge aluminum, stainless, copper base alloys, zirconium, magnesium or killed steel . . . if you use an Airco manual Heliweld Holder. You throw away less than one inch of stub (not 3 inches).

You make other savings too. You use alumina nozzles, for example, which have high resistance to heat and impact shock. You save on the gas, because you need less for adequate coverage.

2. A HOLDER FOR EVERY JOB—The complete range of Airco Heliweld Holders, rated from 100 to 500 amps, assures proper holder selection for your job.

3. FULL CAPACITY RATINGS—The five Airco Heliweld Holders provide for the industry's widest range of current selection in a single integrated line. Holders are rated at full capacity for continuous duty cycle for argon or helium, AC or DC. Non-turbulent gas flow and high current density combine to give you welds of X-ray quality.

4. EASIER HANDLING—For easier handling try the new H35-B. You'll find it the standout holder for work in tight corners. All of the holders feature Airco's non-slip corncob handle. Weights are a mere 4 ozs. to 11 ozs.

Heliweld Economy Packs are available from your Authorized Airco Dealer. He's listed in the Yellow Pages under "Welding Equipment and Supplies".

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For More Information Circle No. 3 on Reader Service Card.

Redesign for welding highlights machine design program

CLEVELAND, OHIO: Redesign of many types of machinery from cast iron to arc welded steel can prove a powerful weapon against the inroads of foreign competition. This was evident from a review of award-winning contributions in the third Machine Design Award Program sponsored by The James F. Lincoln Arc Welding Foundation. Some 72 engineers from 54 companies participated in the $50,000 cash awards.

First award of $10,000 went to Ernest Duesing, supervisor, Oliver Machinery Co., Grand Rapids, Mich. He described how a wood turning and metal spinning lathe was redesigned to make use of arc welded components and price was reduced 35 percent. (This paper will appear in an early issue of WD&F.)

Second place winner was Fritz M. Hessemer, plant superintendent, Allis-Chalmers Mfg. Co., York Pa. He received $7,500 for an analysis of the redesign of large hydraulic turbine runners from cast iron to arc welded steel at a 30 percent cost saving. Some of the welded blades were a combination of mild steel with stainless steel inserts welded to them.

Third award of $5,000 was received by Adolph H. Kleinsorge, chief engineer, W. B. Knight Machinery Co., St. Louis. He reviewed the welding of steel surface plates, conventionally of cast iron or stone slab. The welded plates proved to be lighter, less costly and more easily modified than former designs.

John K. Liu, associate director of research and Development, Clearing Division, U. S. Industries, Inc., Chicago, was awarded $2,500 for his description of the development of a new welded steel engine lathe, three times as rigid as its cast iron counterpart and built at a 12 percent savings.

INDUSTRIAL ARTS TEACHERS from New Jersey high schools look on as Robert Bercaw, Hobart Bros. Co., demonstrates vertical-up welding.

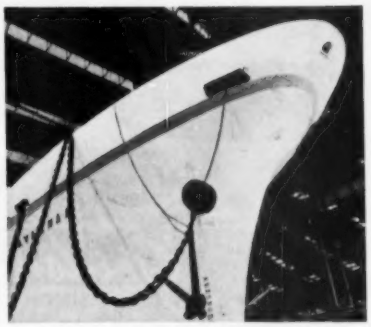
New Jersey High Schools Resume Welding Training

TRENTON, N. J.: After several years of not being offered in New Jersey high school industrial arts classes, welding training is being resumed in 21 high schools in the state, thanks to Trenton State Teachers College and Dr. Robert M. Worthington, chairman of the College's Industrial Arts Department.

This past summer Dr. Worthington conducted a general welding workshop for industrial arts teachers from 21 schools. Welding instructors for the course included Robert Bercaw, Hobart Brothers Co.; Robert Gihand, Linde Company, and Kevin Sheppard of R. S. McCracken and Sons, Hobart distributor in Trenton. At the close of the workshop, each of the 21 teachers received a certificate permitting them to teach welding in their respective schools.

Corn Picker

Flood Pumps



Nuclear Ship

...where you find companies that take great pride in the superiorities of their product, you'll generally also find great reliance on Murex welding electrodes.

Murex electrodes comprise one of the broadest lines of quality rods and wire. Choose from over 1000 types and sizes —mild steel and low alloy, stainless, hard surfacing, etc. Ask the M&T man or send for free literature. Also for information on M&T's complete line of welding machines.

M&T **welding products**

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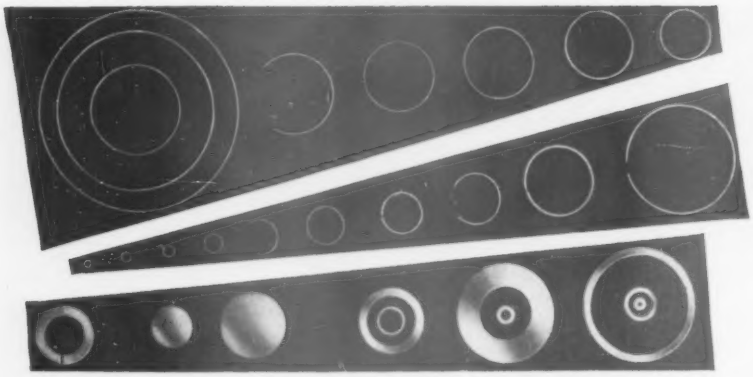

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GB *PRE-FORMED* Silver Brazing Alloys are available in the size and shape your job requires. Pre-formed shapes, like those shown, are designed for the joint. They assure strong, safe connections with a measured, minimum amount of alloy to save you time and money.

Write today for facts about efficient, economical GB 88 Flux and GB Silver Brazing Alloys in random coils, strip, pre-formed rings or special shapes.

Dealer Distributor Inquiries Invited — Write for GB Data Book

GB Goldsmith Bros. DIVISION OF NATIONAL LEAD CO. Est. 1867

1300 W. 59th Street • CHICAGO 36, ILL. — NEW YORK • OAKLAND

A Measured Amount of Silver Brazing Alloy Will Produce A Better Looking and More Cost Controlled Joint.

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A. O. Smith Appoints Milwaukee Distributor

MILWAUKEE, WISCONSIN: An important move to meet increased customer requirements has been announced by A. R. Schneller, Milwaukee district sales manager for the Welding Products Division, A. O. Smith Corp. Named distributor for all of A. O. Smith's electrodes and welding machines is Northern Gases and Supplies, Inc., 1831 West Atkinson Ave.

Portable X-ray Unit Meets Navy Standards

STAMFORD, CONN.: Balteau Electric Corp. has met the U. S. Navy Bureau of Ships specification MIL-X-19685 for X-ray apparatus, radiographic, industrial. Announcement was made by Marcel Marechal, vice president, following four days of intensive testing by the U. S. Navy of the Baltospot 140 unit at the Balteau plant.

Galv-Weld Announces New Distribution Policy

BRADENTON, FLORIDA: A new distribution program for Galv-Weld Alloy will include the appointment of independent distributors, according to Morton L. (Mort) Clark, who developed the regalvanizing process in 1936. The new policy was tested last year in Metropolitan Chicago following an agreement with U. S. Steel Supply Division of U. S. Steel Corp., then world wide distributors.

Midwest Welding Conference in February

CHICAGO, ILLINOIS: Welding and brazing applications in the missile and aircraft industries will be among the major topics to be discussed at the 6th Annual Midwest Welding Conference to be held here February 3 and 4. The conference is sponsored each year by Armour Research Foundation of Illinois Institute of Technology and the Chicago Section of the American Welding Society.

The meeting will be held in the Illinois Tech Chemistry Building, 3255 S. Dearborn St.

Compact, portable Victormatic weighs about 100 lbs., measures 10" x 18" x 20", is amazingly easy to operate.

VICTORMATIC is a portable, semi-automatic, sensibly priced and specifically engineered for hardfacing with continuous coil, fabricated-tube wire. You buy it for less than a welder's monthly wage and it will pay for itself in a matter of weeks by . . .

- boosting production. Handles hardfacing jobs from build-up to finish overlays, semi-automatically.
- eliminating stub-end waste and rod changing time.
- reducing costly equipment downtime.

VICTORMATIC ties in, *in minutes,* with almost any standard 300 amp. welder — rectifier type, gas, or electric. It is ideal for field use with gas driven, portable welder. Operates as full-automatic when coupled with suitable positioning device. Adaptable for submerged arc and drawn wire welding.

Ask your Victor dealer for a demonstration today . . . see for yourself how much faster and cheaper you can hardface with a VICTORMATIC.

Profitable dealerships open; inquire now!

For Top Performance use Victor Automatic and Semi-Automatic Wires. Complete line of continuous-coil wires for hardfacing and build-up; give you high deposition rate and notably low spatter loss. Victor guarantees consistent uniformity from coil to coil, regardless of lot date. For welding and wear, compare Victor wire with any other wire — on your job.

VICTOR for hardfacing

VICTOR EQUIPMENT COMPANY

Alloy Rod & Metal Division

H-64

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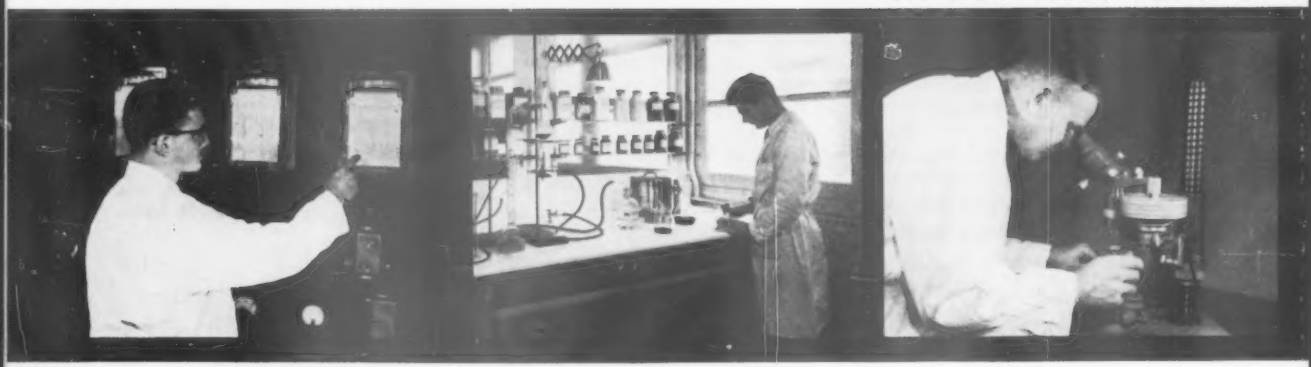
For More Information Circle No. 67 on Reader Service Card.

PROGRESS IS NEVER A

To the Welding Industry...

EUTECTIC RESEARCH MAKES THE BIG DIFFERENCE

IN OUR 20th YEAR OF



World Headquarters
Flushing, New York

For More Information Circle No. 24 on Reader Service Card.

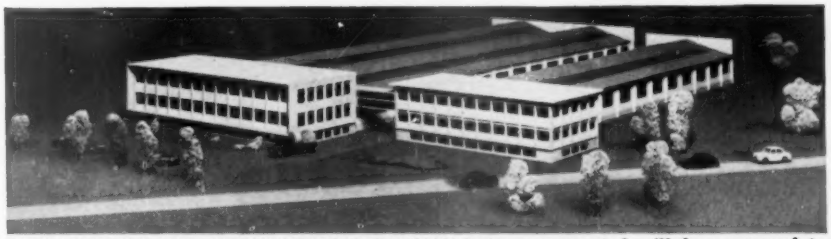
MATTER OF CHANCE

Real progress doesn't "just happen". It must be carefully and deliberately *created!* It requires dedication and a relentless desire to make things better than they are.

Ceaseless research has been the key to EUTECTIC progress since its inception 20 years ago. It began with the discovery of the "Surface Alloying" principle and the development of the exclusive Low Heat Input Welding Process – and has continued through the development of the more than 160 EUTECTIC "Low Temperature Welding Alloys"®, Fluxes and Welding Aids. The purpose has always been the same: to develop better methods of providing faster, easier and stronger welds... *while minimizing stresses, embrittlement, distortion and warpage created by conventional high heat methods.*

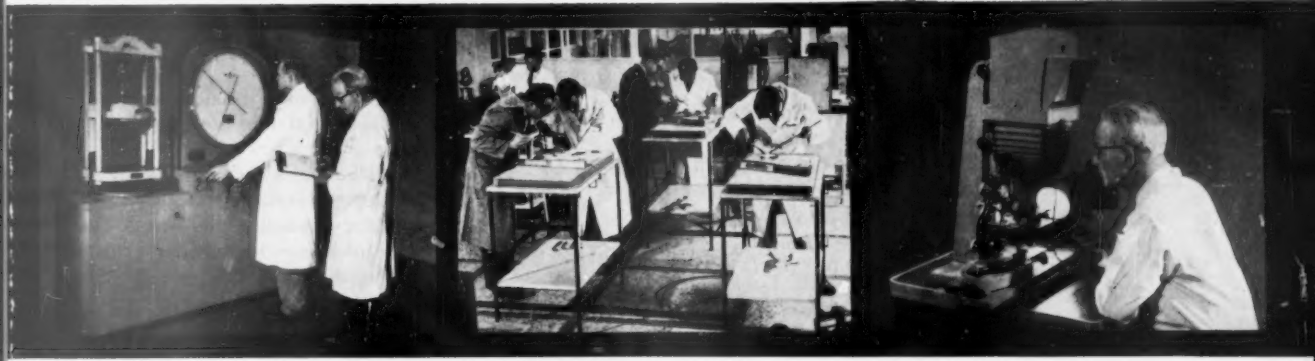
Today, these efforts are still going on – more than ever before! Every year finds new plants... new laboratories... new equipment being added to our already extensive facilities throughout the world. Soon, a vast new Foundry and Metallurgical Center will be completed – heralding the start of the most ambitious research and development program ever undertaken by this or any other company in the field.

Progress, based on research, is the primary aim at EUTECTIC. And progress *to us* means better products, improved techniques, and greater service *for you.*



NEW FOUNDRY AND METALLURGICAL DIVISION being constructed will house complete facilities for metallurgical research and developments, as well as the actual production of core wires from virgin metal.

PROGRESS AND SERVICE



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WAREHOUSES: DARTMOUTH, N. S., TORONTO AND VANCOUVER

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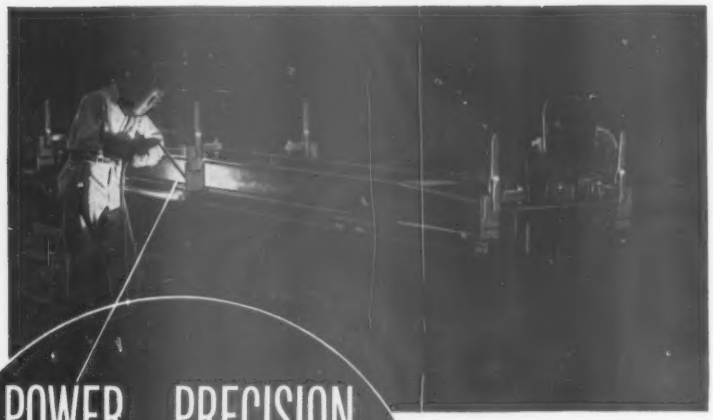
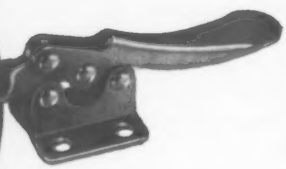


POWER...PRECISION
SPECIFY
DE-STA-CO
TOGGLE CLAMPS
FOR QUALITY, TOO!

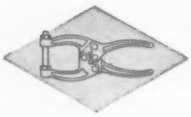


De-Sta-Co "Tiny Toggles" are ¾" high, 2¾" long when closed. Many different bases. U and solid work-holding bars. Ideal for light gauge welded assemblies where space is at a premium.

International Conveyor built this fixture to produce over a hundred 18' wheeled conveyor fixtures on which automobile frames are assembled. The 7" H-beams are brought to bear properly during welding, even sprung to fit, by six De-Sta-Co Model 558 Clamps developing over 2500 lbs. pressure. The completed conveyor line assembly fixtures also employ De-Sta-Co Toggle Clamps.

If your holding problems are at the opposite extreme, there's a group of "Tiny Toggles" only ¾" high but packing 42 lbs. of pressure. This is just an indication of the range you'll find in the De-Sta-Co line of over 130 models, types and sizes for every conceivable fast-action parts holding job. Welders predominantly specify our portable plier clamps. A broad selection of spindle accessories makes it easy to fit any clamp to your job. Along with this versatility, notice the quality features, such as plastic grips, cadmium plating, hardened bushings and serrated pivot pins, as you might expect of the originators of production speed-clamping devices.

Send for new catalog showing many clamp applications, dimension drawings and mechanical data. Ask for the name of the De-Sta-Co stocking distributor in your area.



Portable Clamps

Angular-Bar Type

Air-Operated Type

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DE-STA-CO
Originators of Production Clamping

DETROIT STAMPING COMPANY
324 MIDLAND AVENUE • DETROIT 3, MICHIGAN

For More Information Circle No. 20 on Reader Service Card.

BADGES like this one were made in a week instead of 30 to 45 days as a . . .

Low heat input silver alloy solves UN's badge problem

WHEN THE EGYPTIAN CRISIS of 1956 threatened to erupt into World War III, the United Nations General Assembly hastily voted into existence its Emergency Force to supervise a cease fire. Three days before the first UNEF troops landed in Egypt, the office of UN Secretary-General Dag Hammarskjold placed a rush order with a metal fabricating firm to design and produce suitable identifying badges. The company was given only a week to the job which should have required 30 to 45 days. To do the job, it took a production miracle and a special low heat input silver alloy.

Designs, dies and nearly 40 manufacturing operations—20 alone in the complex enameling job—were done in record time. In a matter of days, components for the badges were ready for assembly.

However, one major problem remained: How to join the enameled UN insignia to the chrome-plated face of the badge and fasten the pin to the badge's back. Joining to the chrome was bad enough, but there was also the danger that heat used to apply filler metal would burn or discolor the enamel on the insignia.

A specially-formulated silver-bear-

continued on page 59

No underbead cracking even in "difficult" steels!

...with P&H Low-Hydrogen electrodes

And what a money-saver that can be — you cut out costly rewelds — get perfect jobs the first time on high carbon, alloy, high sulfur, free machining, and cold rolled steels.

What's more, with P&H Low-Hydrogen electrodes, you get better impact properties, greater ductility, and sounder welds. And, because these electrodes have a mild steel core, they cost much less than the high-alloy types otherwise required.

Get complete data. Ask for Bulletin R-29, "P&H Smootharc Welding Electrodes." Write Dept. 317B, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H WELDERS • ELECTRODES • POSITIONERS

MILWAUKEE 46, WISCONSIN

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EMERSON ELECTRIC

PORTARC 180c

180c

...HIGH CAPACITY PERFORMANCE!

...LIGHTWEIGHT FOR EASY PORTABILITY!

...LOW, LOW PRICE!

The Emerson Electric Portarc 180c... cuts, brazes, solders, welds... can be used with twin carbon torch. One man can carry this compact, 68 lb. unit wherever it's needed. The Emerson Electric Portarc 180c delivers maximum amperage for any of the 6 most commonly used welding heats. Uses most types of 3/32" to 3/16" AC rods. Dependable Emerson Electric 8" four-bladed fan provides effective cooling. Get the Emerson Electric Portarc 180c—at a new low, low price.

A COMPLETE LINE FOR MOST WELDING NEEDS

90 AMP	180 AMP	205 AMP	295 AMP	200 AMP DC
Light Duty	Medium Duty	PORTARC	Heavy Duty	Gas Engine Driven

See your local Emerson Electric Welder Distributor or Write Dept. W531 for Specifications and Prices!

EMERSON ELECTRIC
of St. Louis

8100 FLORISSANT • ST. LOUIS 36, MO.

For More Information Circle No. 23 on Reader Service Card.

Facts At Your Fingertips

If you want details about products described or advertised in this issue, circle the number on the card that corresponds with the number under each advertisement or product description.

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If not, use this card to give us your complete mailing address plus the old (incorrect) one

W D & F is now addressed like this:	It should be changed to this:

Products manufactured (or other business carried on) at this address

My job title

Signature

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Name

Position

Company

Kind of Business

Street

City

Zone State

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2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242	258	274	290	306	322
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243	259	275	291	307	323
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244	260	276	292	308	324
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245	261	277	293	309	325
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246	262	278	294	310	326
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247	263	279	295	311	327
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	264	280	296	312	328
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	265	281	297	313	329
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	266	282	298	314	330
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	267	283	299	315	331
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	268	284	300	316	332
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	269	285	301	317	333
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	270	286	302	318	334
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	271	287	303	319	335
16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320	336

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3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243	259	275	291	307	323
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244	260	276	292	308	324
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245	261	277	293	309	325
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246	262	278	294	310	326
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247	263	279	295	311	327
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248	264	280	296	312	328
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249	265	281	297	313	329
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250	266	282	298	314	330
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251	267	283	299	315	331
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252	268	284	300	316	332
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	269	285	301	317	333
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	270	286	302	318	334
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255	271	287	303	319	335
16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320	336

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NEW PRODUCTS—brief descriptio of significant new products a materials.

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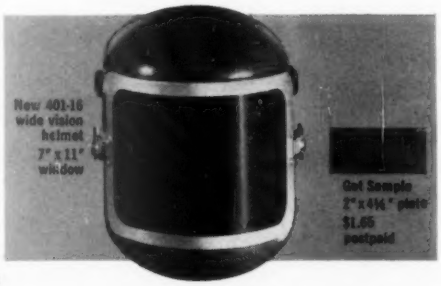
Use a PLASTIC filter for Arc Welding?

NO! NO!

• Until now, the answer has been emphatically *no!* But for the first time anywhere, a plastic plate is available that will filter the harmful ultra-violet and infrared rays of arc welding—and filter them to the same degree as the rigid standards set for glass in Federal specifications. Years of research have resulted in CESCO's new **PLASTI-WELD*** filters, which give arc welders these unusual advantages:

- **LARGE WINDOW AREA**
  In addition to the standard size 2" x 4¼", PLASTI-WELD FILTERS may be used in CESCO 401-16 and 403-16 helmets. These give 77 square inches of viewing area, *curved* for panoramic vision.
- **LESS FREQUENT REPLACEMENT**
  The slightly higher price of PLASTI-WELD filters is greatly offset by their ability to outlast glass, *as much as 6 to 1.* Less breakage from dropping, impact or thermal shock.



- **HIGHER VISIBILITY**
  Comments from hundreds of welders who field-tested PLASTI-WELD filters state that they give "unusual clarity—sharper definition of outline." Result: better output, higher quality work.
- **LIGHT WEIGHT**
  The 2" x 4¼" PLASTI-WELD filter, encased in its own rubber gasket, weighs less than one ounce, compared with two-and-a-half ounces for the average glass plate and cover glass. Regular lens gasket is not required. 7" x 11" PLASTI-WELD filter weighs only four-and-a-half ounces.

CESCO

FOR MORE INFORMATION about CESCO PLASTI-WELD filters, contact your nearby CESCO distributor or write our Chicago office

*Pat. Pending

CESCO FOR SAFETY

CHICAGO EYE SHIELD COMPANY • 2711 West Roscoe Street, Chicago 18, Illinois

For More Information Circle No. 19 on Reader Service Card.

"DURO is the coolest"*

*says Ben Ruff of Reed & Graham, Inc. "Before I had to change holders whenever the one I was using would get hot. Now, with DURO, I can weld a whole shift without the holder getting hot to my hand, even when using 5/16 in. hardfacing electrodes at high amperages."

DURO will do the same for YOU
Proved by 27 years of weldor's preference

The DURO "Standard"

- All parts quickly replaced with a screwdriver
- Screw-in type jaws—no tools required
- Insulated handle and guard—protects the operator
- Rugged fibre handle—lasts longer
- Cool operation—cool handling

Featuring "Long Jaw Design" for reaching those "hard to get at places."

The DURO "DUROGON" Tong-Type

- All parts quickly replaced with a screwdriver
- Fully insulated—greater safety
- Cool operation—cool handling
- DUROGON-N3—Aluminum body—extremely lightweight; less operator fatigue; mechanical cable connection
- DUROGON-N3HD—Bronze body—heavy duty operation; mechanical, soldered or brazed connection.
- "The BEST of this popular design"

DURO
ENGINEERING COMPANY • 31 OREGON AVENUE
HAMDEN, CONN.

For More Information Circle No. 21 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

MACK

TAYLOR

PROMOTIONS:

Budd L. Mack has been promoted from district sales manager to sales manager, Electronic Controls Section, of the *Budd Company*, Philadelphia.

P. E. Taylor has been named vice president in charge of sales at *Smith Welding Equipment Corp.*, Minneapolis. He had been vice president in charge of production and personnel.

At *Norton Company* Worcester, Mass., **Robert Cushman** has been appointed general sales manager of the company's Abrasive Division. He is succeeded by **W. Alex McCune** as sales manager of grinding wheels.

APPOINTMENTS:

ELLIOTT

PELICH

Edward Elliott, Jr., has been named manager of the industrial medical sales for the *Liquid Carbonic Division of General Dynamics Corp.*, Chicago.

William J. Pelich has been appointed sales manager for *Denison Engineering Division, American Brake Shoe Company*, Columbus, Ohio.

J. Paul Montanye has been named application engineer for the *Colmonoy Division of Wall Colmonoy Corp.*, Detroit. He will cover the West Coast from offices in Montebello, Calif.

Circle No. 14 on Reader Service Card. →

150 pounds
300 KV

The Revolutionary Baltograph 300

This remarkable unit represents the greatest single forward step in industrial radiography in many years. The Baltograph 300 . . . for the first time . . . combines a power rating of 300 KV and penetration capability of 4" of steel while weighing only 150 lbs. . . . a new low for x-ray equipment in the higher power ranges.

From thin walled aluminum and magnesium castings x-rayed in the plant to heavy weldments x-rayed in the field, the Baltograph 300 is capable of handling them all. The inefficiencies of "part-time use" equipment, limited in application and scope, can now be eliminated.

For a **free demonstration on your work . . . at your plant or on the job-site . . . write, call** or wire **collect today:**

Balteau Electric Corporation
10 New Street Stamford, Conn.

Balteau

NEW FROM TEC

THE NEW TEC AIR-COOLED TORCH!

MODERN DESIGN BY TEC

Tec research and endless testing have provided an easy handling and smooth, effortless operating, the most up-to-date air-cooled torch on the market.

USER MINDED ECONOMY

Tec Visuweld transparent Gas nozzles (both standard and off-set) and Tec chucks are interchangeable with the new air-cooled torch . . . no need to stock or store new parts.

GAS SAVING ECONOMY, TOO

Preliminary testing has already indicated that considerably less gas with greater coverage is afforded with the new air-cooled.

RUGGED CONSTRUCTION

Durable and long lasting due to one piece construction of phenolic plastic reinforced with macerated fiber glass.

Contact your local distributor or write:

SPECIFICATIONS

Engineered to most efficient performance.

MODEL 3110 (Pencil Grip)
Rated Capacity:
Continuous duty cycle: 80 Amp.
Overall length: 9¾"
Handle diameter: 1 inch.
Maximum electrode length: 6 inches.
Electrode diameter: .020, .040, .0625.
Cable lengths: 12½ or 25 feet.

MODEL 3330 (Pencil Grip)
As above except:
Rated Capacity:
Continuous duty cycle: 130 Amp.
Reduced duty cycle: 150 Amp.
Electrode diameter: .020, .040, .062, .093.

MODEL 3220 (Angle)
Same as 3110 except:
Overall length: 8 inches.
Handle diameter: 1 inch.
Electrode length: 3 inches.

MODEL 3440 (Angle)
As ove except:
Rated Capacity:
Continuous duty cycle: 130 Amp.
Reduced duty cycle: 150 Amp.

TEC TEC TORCH COMPANY, INC., CARLSTADT, N. J. MANUFACTURERS OF VISUWELD EQUIPMENT

For More Information Circle No. 61 on Reader Service Card.

MEN ON THE MOVE

continued from page 20

HONORS:

Arthur D'Espies, *Welding Alloy Mfg. Co.*, Newark, N. J., receives an engraved plaque for his loyalty and untiring efforts on behalf of the *National Welding Supply Association.* Award was presented at the NWSA's recent Eastern Zone Meeting by **J. W. Goodliffe** (left).

The *Society for Nondestructive Testing* has presented the annual Deforest Award for "outstanding contribution" in this field to **Prof. Robert C. McMaster,** professor of welding engineering at *Ohio State University*, Columbus. Dr. McMaster is a past president of the Society and served as editor of the *Nondestructive Testing Handbook*, published last month.

PROMOTIONS

MURCHIE

Donald J. Murchie has been named general sales manager for **Stulz Sickles Co.,** Elizabeth, N. J. Formerly district sales manager for the East Central States, Mr. Murchie will direct the sales and marketing of the company's welding products.

OVERSEAS:

Donald W. Smith, chief engineer of *Sight Feed Generator Company*, West Alexandria, Ohio, is in Algiers, Algiera, where he is working with Compagnie Algerienne De Tracteurs.

NEW NEW NEW NEW NEW NEW NEW NEW NEW

WHEN IT

MELTS

you know the *temperature!*

NEW

Markal®

THERMOMELT

TEMPERATURE INDICATORS

the easy modern way to determine exact working temperatures!

Just mark or stroke the surface with THERMOMELT . . . when it reaches the desired temperature, the mark liquefies. There's no guesswork, no wasted time or material . . . THERMOMELT is the quick, precise way to determine heating temperatures. Accurate to within ±1%.

A STIK FOR EVERY TEMPERATURE from 113°F. to 2000°F.

ALSO AVAILABLE IN LIQUIDS AND PELLETS for inaccessible or hard-to-measure applications. Wide range of temperatures.

Send today for free THERMOMELT literature and pellet sample (indicate temperature desired).

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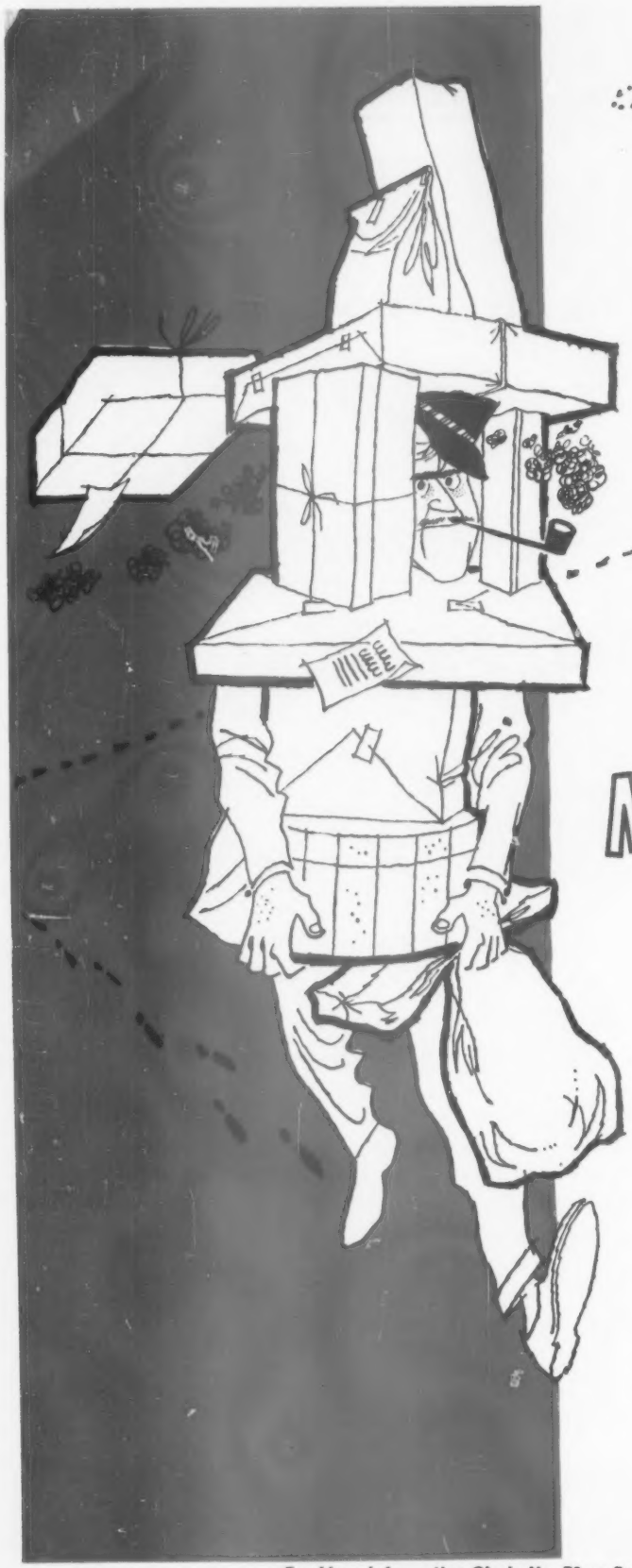

ARE YOU A MULTI-BUNDLE BUYER?

For More Information Circle No. 70 on Reader Service Card

Think of the poor fellow who buys a shirt from one store . . . a suit from another store . . . and a topcoat and a pair of shoes from still a third. His bundles grow; invoices, statements and receipts from so many sources multiply his paper work; and delivery dates are uncertain.

Liquid Carbonic eliminates multi-bundle buying in the welding field—by providing a full line: welding and cutting equipment, industrial gases, accessories for gas and arc welding and all other welding supplies. Our principle of single-source supply makes shopping easier, less expensive for you!

Have your Liquid Carbonic representative show you his "Case of Jewels"—a handsome display of precision-made Liquidweld torches and regulators. Ask him, too, about any Liquidweld equipment or supplies you may need.

INDUSTRIAL GASES, LIQUEFIED AND GASEOUS

Oxygen	*Welding Grade CO_2*
Argon	*Acetylene (gaseous only)*
Nitrogen	*Hydrogen (gaseous only)*

Write today for free illustrated literature on Liquidweld apparatus . . .

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Liquid Carbonic Division
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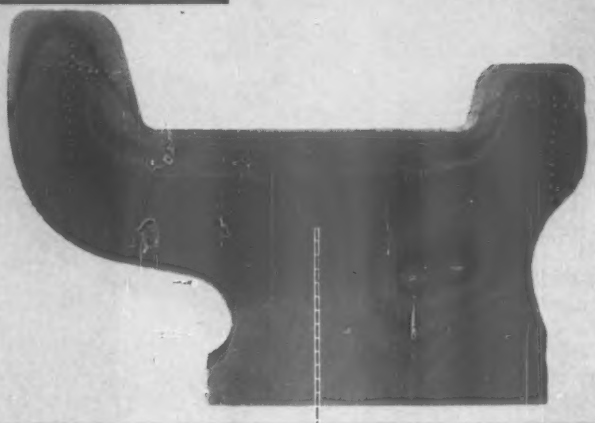
Chicago 3, Illinois
In Canada: Liquid Carbonic Canadian Corporation, Ltd., Montreal 9, Quebec

For More Information Circle No. 70 on Reader Service Card

Page Welding Wire

CUTS COSTS FOR TRACK SERVICE COMPANY...



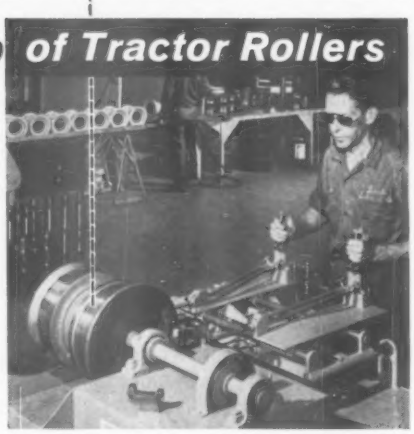
Provides Fast, Economical Build-up of Tractor Rollers

• Two PAGE welding wires have helped Track Service Company of Oklahoma City develop a new method of building up the roller bearings and flanges of tractor rollers. As seen in the section of a flange above, the finished build-up has a smooth machine finish with uniform Rockwell hardness.

The running surface, or bearing, is built up by automatic welding with PAGE analysis A-S-6150—the flanges with A-S-65. Both of these welding wires are machineable as welded, making it easy to machine the welded roller to finished dimensions. At this point, the Rockwell hardness of the flange is C-25, with a hardness on the running surface of C-40/50.

The flanges are then heated to 1500°F and immediately water-quenched, giving a non-spalling surface of about Rockwell C-55 and shading down to Rockwell C-40 at the base metal.

This build-up method is fast—and far less costly than the usual tubular alloys. It's also a good example of the versatility afforded by the wide selection of PAGE welding wires.



Flame hardening of flanges is done on this machine designed by Track Service Company. Top illustration shows cross-section of hardened flange.

Let PAGE Help Solve Your Welding Problems

These Folders can help you

Write for:

Folder DH-402-C Contains information on submerged arc and inert gas automatic welding wire. Lists descriptions and uses of the many PAGE analyses. Describes our extensive variety of packaging. Illustrated.

Folder DH-1218 • Chart lists detailed analyses of PAGE automatic welding wires, metal spray wires, bare electrodes and gas welding rods. Shows uses and physical properties. Lists most competitive makes.

When you bring your welding problems to PAGE, you get the benefit of over half a century of wire drawing experience and leadership in metallurgical research. Leadership evidenced by the industry's widest range of analyses —33 grades designed to do an endless variety of welding jobs. Let PAGE help you improve your quality and lower your costs by furnishing the right wire for your job.

PAGE wire packaging is designed to give you the utmost in convenient storage and handling, whether you require a 1# spool or a 1200# payoff-pallet. Prompt delivery is assured from a coast-to-coast network of PAGE distributors backed up by strategically located PAGE warehouses.

You will find it is "good business" to bring your problems to PAGE.

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*Indicates PAGE warehouse stocks

PAGE—THE SOURCE FOR ANSWERS TO WELDING PROBLEMS

For More Information Circle No. 47 on Reader Service Card.

DECEMBER, 1959
Welding Design & Fabrication
ESTABLISHED IN 1930 AS INDUSTRY & WELDING

MARIO DiFEDERICO, president of Firestone Steel Products Co., (seated) discusses welded design with Associate Editor Anthony R. Mellini (standing).

Metal Working Firm Diversifies With New Welded Products

by **ANTHONY R. MELLINI,** *associate editor*

IN BRIEF: Welded design keeps the door to the future open for this metal working company. It lets Firestone Steel Products diversify by adding more and more new products to its line.

WELDING at Firestone Steel Products Company has evolved in 52 years from the manually controlled welding of truck rims to the accurate machine welding of components for guided missiles.

Each new welding technique developed or adopted by Firestone has yielded several new products to aid in the company's diversification program.

"In 1907, we needed highly skilled workmen to control flashing and upset in our rim production line," says Firestone's head, Mario DiFederico. "To speed production, we worked with equipment manufacturers to develop automatic flash welding machines. They took the guesswork out of rim welding. We've been the world's largest producer of truck and bus rims since the early part of the century. In recent years we have become a chief producer of off-the-highway rims."

The next major development for Firestone and the industry was tungsten arc welding. "It opened new avenues for product development to us," DiFederico said. "We used it to make stainless steel beer barrels. Our experience with stainless steel helped to produce oxygen cylinders during World War II. We used tungsten arc and resistance seam welding on them.

Our resistance seam welding experience, along with spot and projection welding, helped us to diversify.

With resistance and tungsten arc welding playing an important part, we developed and manufactured syrup tanks, Premix containers, milk cans, and jet engine parts."

DiFederico pointed out that flash and submerged arc welding, an improved welding technique, led to the production of bogie and road wheels during the Korean war. In this case, it was the experience gained in the production of large rims that made the conversion possible.

"Since the Korean war we have been doing a lot of work with jet engine components," he added. "Here is a case of our being able to use welding techniques which had been developed in previous years."

He said the company uses tungsten arc, metal arc, resistance seam, resistance spot and flash welding to make the jet engine parts.

In recent years the steel products company has gone into the production of automotive trim. Spot, seam and projection welding techniques are used for this assembly-line job. *turn the page*

"Submerged arc welding," DiFederico said, "led to the company's recent success with large truck and earthmover rims.

"Earthmover rims too large for existing machinery were fabricated by Firestone. "The 33 x 28.00 rim," DiFederico said, "is made in four pieces and welded together using submerged arc." (See page 29 for design details.)

"For this job," he said, "We developed the best joint in the industry. The weld gives 100 per cent joint efficiency."

The next significant step taken by Firestone was the use of the CO_2 gas shielded arc process. This made it possible to join component parts of tubeless bus and truck rims. An adapter ring was developed to make it possible to mount rim assemblies onto cast wheels.

"The newest thing we're making is tapered disc truck and bus wheels," DiFederico said. "We're using a new welding process for wheels, exclusive with Firestone, to attach the disc to the wheel. These are the only truck wheels being welded today.

"The new technique, is a through weld which attaches the two components without piercing or disturbing the surface of the rims. For tubeless tire rims this prevents the loss of air that sometimes happens when you use rivets.

"Fatigue life of the through weld is excellent, has been found to be 80 percent stronger than other wheel joints."

The Akron steel products firm also is engaged in research and development work on guided missile components. Motor cases, pressure vessels and spheres for rocket motors.

"The future for Firestone and the welding industry is un-limited," DiFederico said. "More and more products will fall into the realm of our business interests as new welding techniques are developed. We intend to continue to pioneer in this field."

How Firestone Designs And Welds Earthmover Rims

by MARIO DiFEDERICO, *president, Firestone Steel Products Co., Div. of Firestone Tire & Rubber Co., Akron, Ohio*

COMPETITION in manufacturing is real. It's immediate, it's pressing. One must scrutinize every possible way to keep up. We design our products so we can make them economically. We design them to perform well, to meet the needs of buyers.

MANUFACTURING

Welding gives us a truly overall freedom of design. Submerged arc welding, for instance, led to our success with earthmover rims. We fabricate the large earthmover rim bases in three and four sections. Our rim bases are made from low carbon, semi-killed steel. We found this gives us a combination of strength, weldability, and formability.

In fabricating the bands that make up the base, first we circle and flash-butt weld them. We then size them to specified roundness and diameter before they go to the submerged weld department.

We fabricate the tire bead seat band and other earthmover rim components the same way.

DESIGN

Our original joint design was based on designs the industry was using at the time. Figure 1 shows the industry's original design. Figure 2 shows our original design. Our joint design was strong, gave good service. But it had drawbacks.

Let's face it. It was costly to prepare that joint. It required precision machining on all components. It was more difficult to align than the industry joint. And, it had no pilots. Finally, it required very precise welding control to prevent first pass burn through. This resulted in excessive rework.

You might wonder why we went to so much trouble. You might wonder whether our joint was so much better than the industry joint. Well, we thought it was. And our view was reinforced when those who used the industry joint had to modify it. Welded from one side, the industry joint failed in fatigue in the field. To overcome this failure the industry now welds the toe of the back flange, as shown in Figure 3.

But, good as our original (Figure 2) joint was, we wanted a better one. Our new rim joint in Figure 4, has the efficiency of our original, but all the drawbacks are gone.

ADVANTAGES OF NEWEST JOINT

Higher Strength Joint: It's a modified butt joint with uniform section thickness and balanced welding. The stress distribution is equalized throughout the joint. The new patterns also have ledges so we can press fit the mating parts.

Lower Cost Joint: We reduced material cost over the joint design shown in Figure 1 by using a straight butt instead of an overlapping joint. We precision machine the contour of the center hand. The mating component is contoured by the steel mill rolls. That insures uniform fitup and cavity size; results in equal welding wire consumption from rim to rim. This joint can be made faster. We located the weld joints to give

---

ABOUT THE AUTHOR: Mario DiFederico became president of Firestone Steel Products Company in 1958. He started with the firm in 1947 in the engineering department. He was named head of manufacturing engineering in 1951 and Akron factory manager in 1954.

Mr. DiFederico graduated from the University of Akron as a mechanical engineer and did graduate work at Massachusetts Institute of Technology. He is a member of the American Society of Mechanical Engineers and the Society of Automatic Engineers.

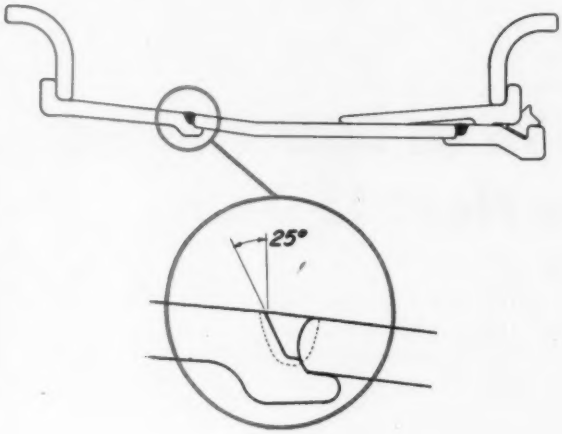


Fig. 1. Industry's original design

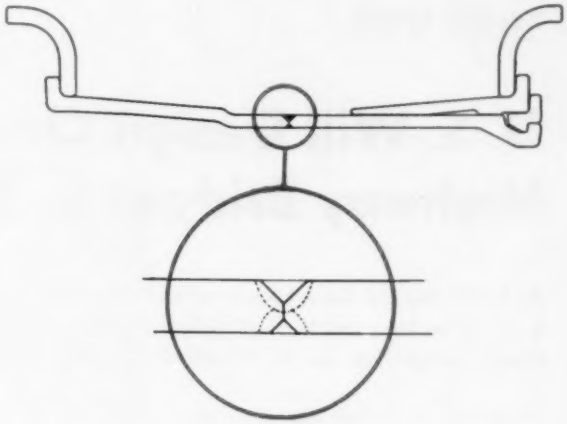


Fig. 2. Firestone's original design

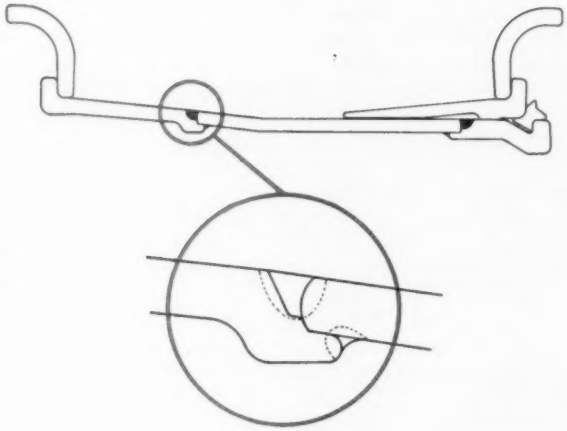


Fig. 3. Industry's present design

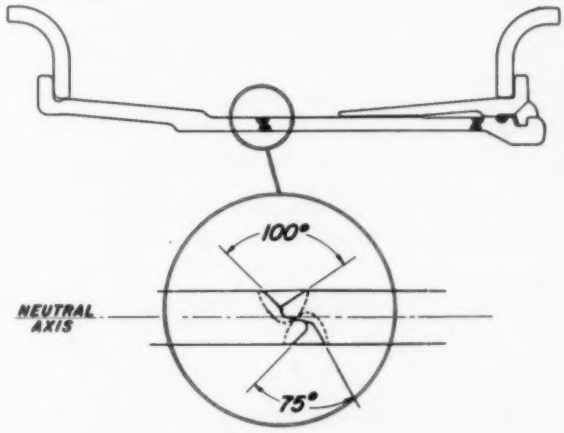


Fig. 4. Firestone's new design

us the most economical components. This also produced more precise components, lead to a truer running assembly.

Less Critical Welding Control: We get complete weld penetration in the old design and we get it in the new. However, the new design has this advantage: If any slight line of unwelded surface occurs, it is in the neutral axis of the section. That's where the stresses approach zero. They're neither tensile nor compressive; therefore there is no fatigue failure.

The refined, balanced joint also eliminated the reworks and repairs caused by first pass burn-thru.

Precision machining of the centerband means that the weld operator's control is less critical because the weld cavity is consistant.

Absolutely Leak Tight Joint: The balanced uniform welds make the new design leak tight and fine for tubeless tires. The old industry design developed leaks due to lack of back-up welding. Any porosity in the outer weld let air leak out.

Flatter Bead: The larger V-opening for the outer weld gives a flatter bead. It's easier to assemble the rim components. There's no need to grind high welds.

It takes a lot of engineering and experience to make a rim that satisfactorily serves an industry that changes as fast as the earth moving equipment industry. • •

U. S. Will Design Close To 41,000 Welded Highway Bridges In The Next 15 Years

IN BRIEF: Marked trend toward welded steel design is evident as top prizes in Steel Highway Bridge Design competition go to all-welded structures.

MOST OF THE 41,000 highway bridges to be built in this country's 15-year superhighway program will be welded steel structures.

This is the conclusion drawn from a study of the entries in the Steel Highway Bridge Design Competition. It is sponsored by U. S. Steel's American Bridge Division. Prizes total $44,000. Nearly all of the 15 award winners submitted welding designs. The judges said this same preference for welded fabrication was evident in the entries of most of the serious contenders among the 301 entries.

RULES

The contest called for designing a two-lane bridge over a modern, four-lane divided highway. Winners were chosen on originality of design, full use of steel's properties, economy and appearance.

REASONS

The purpose of the contest was to stimulate thinking about steel. But, it also stimulated thinking about the importance of welding in getting the best from steel. Some designers said they were able to meet contest rules only because they used welded design.

RESULTS

The top award of $15,000 went to Allan M. Beesing, a Buffalo, New York, structural design engineer. He designed a graceful, arched steel structure with twin welded girders. Like most of the winning designs, this one uses of the properties of carbon and high strength steels to put an unobstructed, continuous 160-foot span —with no center pieces—over the four lanes and divider of the highway. This would have been impossible with other materials.

The $4,000 first prize in the student division went to an entry described by its designers as a "shop-welded frame bridge." The co-designers, Niels J. Gimsing and Hans Nyvold of Denmark, designed a two-span bridge. They claim it lends itself to mass production. Most of the fabrication can be done in the welding shop. Erection requires just a few riveted or bolted connections. The designers say field welds would

continued on page 59

Bridge designers have these three choices . . .

Bridge members must be of the assembly-line type. This narrows the steel bridge designers' alternatives to three: rolled beams, riveted girders or welded girders:

ROLLED BEAMS

Ordinary rolled beams are too inefficient for bridges. Present structural shapes were not designed to use steel economically. The 36-inch depth is the biggest available. That limits their use as girders to spans of 70- to 80-feet maximum. The reason? The design of such girders is usually governed by the live load deflection requirements of the American Association of State Highway Officials. It's possible that specially proportioned rolled sections and new, special shapes could be made for bridge construction. However, it would take time.

RIVETED GIRDERS

Designers say riveted girders have no place in bridges. Why? They say a riveted girder takes more steel than a welded girder. And, the cost per pound is as high or higher.

Besides high initial cost, riveted girders are hard to paint and maintain. They look clumsy too. Designers say it is poor engineering to punch holes out of good structural material and then fill them up with rivets, when you can weld instead.

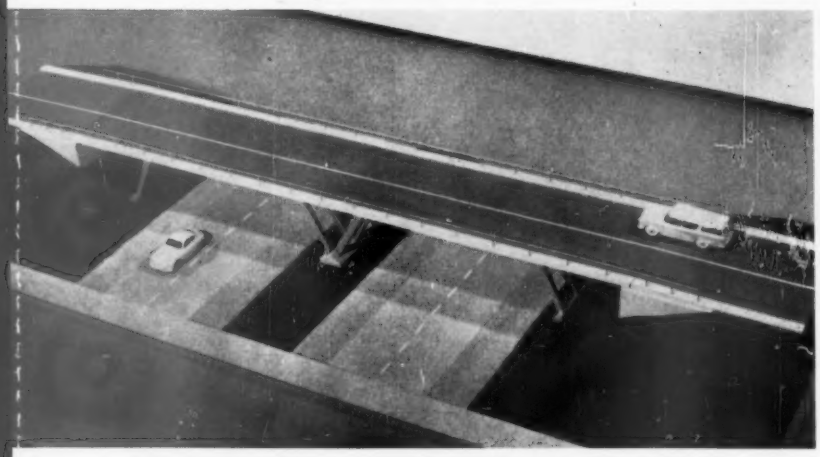
The designers add that riveted construction for highway structures is now obsolete in some States. They feel it will eventually be obsolete in all.

WELDED GIRDERS

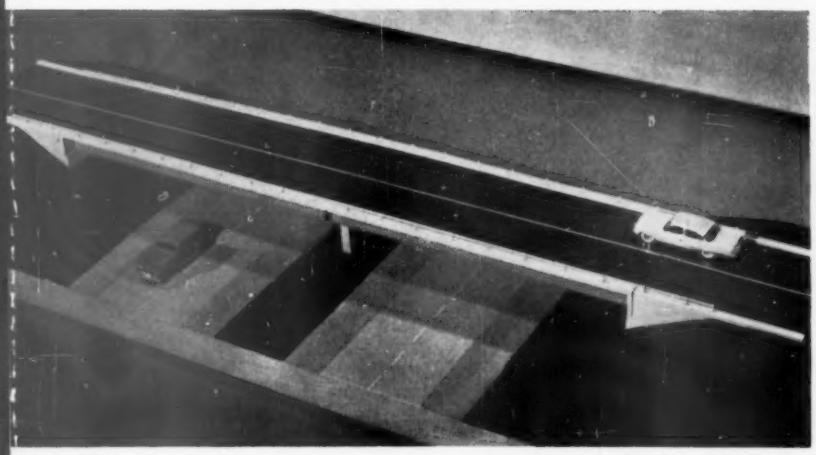
Reinforced concrete and steel are best for bridges. The designers use them for composite design, in best properties of both materials are used.

Welding is the most logical and economical method of assembling steel plates into properly proportioned girders. So, welded girders acting compositely with a concrete deck, make the best, most economical structure.

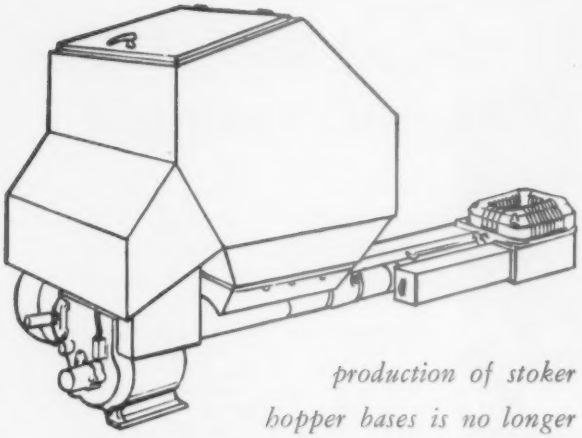
FIRST AWARD of $15,000 in professional division went to this 160-foot span with no center pieces. Designer Allan M. Beesing (right) explains to A. J. Paddock, president of American Bridge Division, U. S. Steel, that "The structure is comparatively free of complicated fabrication and lends itself to speedy erection."



FIRST AWARD of $4,000 in student division went to two Danish students for this shop-welded frame bridge. It was designed for mass production; field erection requires only a few riveted or bolted connections.



COMPOSITE ACTION of welded girder and concrete deck are the feature of this design which won second honorable mention of $5,000 in professional division for three designers from the California Department of Highways.



production of stoker hopper bases is no longer a problem now that a . . .

One-Piece Cast Base Is Replaced By Two-Piece Cast Weldment

By **FLOYD BARKMAN**, *welding supervisor, Will-Burt Company, Orrville, Ohio*

IN BRIEF: Cast-weld construction replaces one-piece cast bases which supplier had trouble casting and delivering on time.

CAST-WELD CONSTRUCTION plays a big part in production of our stoker hopper bases. These were once large, one-piece gray iron castings. We were satisfied with them, but the foundry wasn't. They had been having trouble casting the base in one piece and weren't able to make delivery on time.

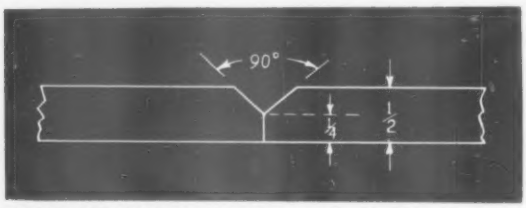
Our engineers suggested cutting the pattern in half and making the base by welding the two cast halves together. The foundry said this would make casting easier and faster. But, they weren't keen on the idea of welding. They thought we would have a lot of trouble making a satisfactory weldment. But, they went ahead and made us some samples for a trial run.

TRIAL AND ERROR

After several welding failures, we decided to analyze the gray iron casting and handpick an electrode to do the job. The right electrode turned out to be a special, coated copper electrode. But, it wasn't that easy. We also had to design a special joint and make special fixtures to locate and hold parts.

ONE-HALF SECTION of two-piece gray iron stoker base.

SPECIAL COATED COPPER electrode is used to weld two gray iron castings together (above). Fixture locates and holds pieces and helps position weld.



CROSS SECTION of weld joint is shown here.

WELDING

We found out soon that we had to use the electrode properly to do the job effectively. And we found out soon that welds cracked if we started them from the center or from either end. To prevent this cracking we tack both ends before we start welding from the center out.

We have to be careful when we use this electrode. The first requisite is clean material. We use this 5/32-

continued on page 56

miller
WELDERS

BIG TWIN
250 AC/DC

LITTLE TWIN
180 AC/DC

AND BOTH MILLERS ... *Through and Through*

BIG TWIN combination ac-dc welders work from single phase service — deliver new convenience and economy. Two a-c amperage ranges of 20-125 and 60-290 plus two d-c ranges of 18-100 and 65-290 amps master nearly every welding requirement from light gauge metal to structural pieces. Movable shunt type transformer affords infinite current adjustments. Other features include: Horizontal design for easy stacking; weather-resistant construction and Class B insulation; Miller-built semi-metallic rectifier for best d-c welding; high open circuit voltages and new weld stabilizer. This is THE all-time, all-around welder!

LITTLE TWIN ac-dc combination welder has two a-c amperage ranges of 20-115 and 60-180 plus one d-c range of 40-150. Operating from single phase service, this Miller model incorporates many design and construction features usually found only in large industrial types. These include really rugged construction, forced air cooling, new Miller semi-metallic rectifier, movable shunt type current control, new weld stabilizer and open circuit voltage in abundance. Power factor correction is available on both models. Complete specifications on either model will be sent promptly upon request.

miller ELECTRIC MANUFACTURING COMPANY, INC. • APPLETON, WISCONSIN

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For More Information Circle No. 46 on Reader Service Card.

New Aluminum Alloy: Ductile At -320° F

IN BRIEF: Ultra-low temperature tests have cleared the way for designers to specify a new, strong, ductile aluminum alloy for cryogenic weldments—without the fear of brittle fracture.

ONE OF THE NEWEST and strongest of the aluminum alloys is the aluminum, magnesium, and manganese alloy 5083. It has the go-ahead for ultralow temperature work where temperatures get down to near absolute zero (—459.6°F). The fancy name for this work is cryogenics. Designers will use the alloy for tankers for transporting liquefied natural gas, land-based storage facilities, and for liquefication piping.

Alloy 5083, developed by Kaiser Aluminum & Chemical Corporation for strength, ductility and weldability, already had a good reputation for many highly stressed welded structures. It's covered in codes such as the ASME Boiler and Pressure Vessel Code. But designers wouldn't specify it for low temperatures. They were afraid of brittle fractures.

Many structural materials lose ductility at low temperatures. They become sensitive to stress concentrations caused by notches or by changes in the shape of the part. Local failures start easily, grow quickly into complete failures.

REASONS FOR BRITTLENESS

Temper, microstructure, and welds affect the brittle-ductile behavior of a metal. The stronger (harder) alloy tempers are more susceptible to brittle fracture. As strength increased, ductility decreases.

Another thing, thick plate is less ductile than thin plate. Thin plate has a more uniform microstructure because it gets more work in rolling.

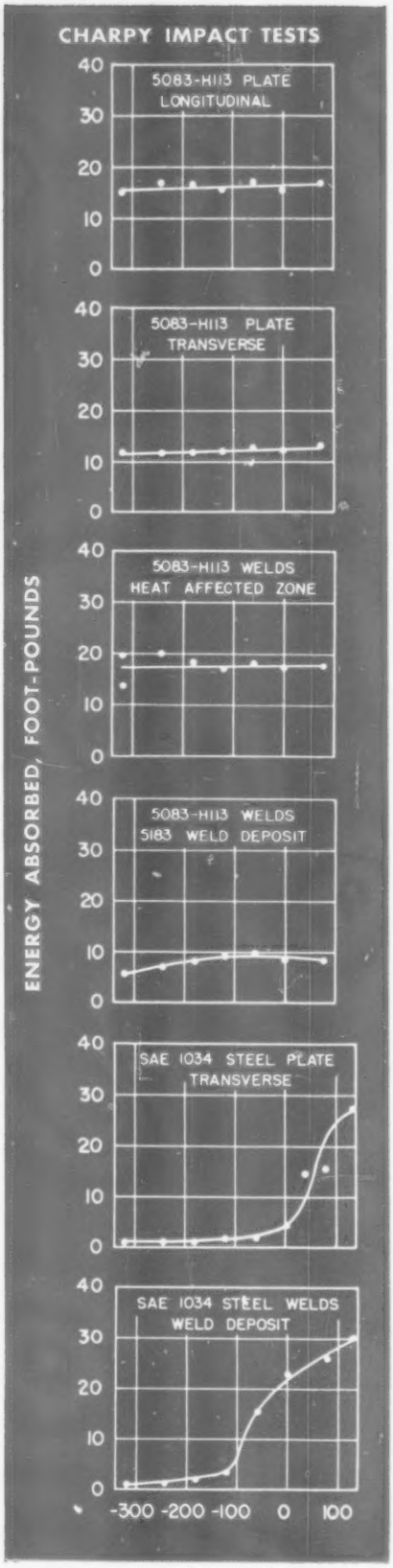
Welds can lead to brittle fracture too: The cast metal of a weld deposit, or the heat-affected zone next to it, often is a point of stress concentration.

SERVICE FAILURES

These are hastened by low temperatures, high rates of loading, and stress concentrations. Kaiser measured the ability of 5083 to resist these things with four tests: tensile; unnotched tensile impact; notched tensile impact; and Charpy keyhole impact. They ran them over temperatures ranging from 75° to —320°F. Impact tests on notched specimens were the most severe, because they involved three causes of failure.

The tensile tests measured the effect of only one embrittling service condition, low temperature. The unnotched tensile impact tests added a second, high strain rate. The notched tensile impact tests and the Charpy Keyhole impact tests added a third embrittling condition, stress concentration.

Continued on page 56



CHARPY IMPACT TESTS, the most severe for evaluating a metal's low temperature ductility, show conclusively that SAE 1034 was brittle; aluminum alloy 5083 was not.

Circle No. 39 on Reader Service Card. ⟶

LINCOLN WELDERS

"IDEALARC TIG"

AC & AC/DC ARC WELDERS

AC High Freq. for Tungsten Inert Gas

DC High Freq. for Tungsten Inert Gas

DC for Manual Electrodes

AC for Manual Electrodes

Remote Control For Crater Filling

Balanced Wave Filter for Superior AC High Freq. Operation

SELECT *ANY* OR *ALL* OF THESE FEATURES IN THE **NEW "TIG" MODELS**

1

AC Inert Gas

DC Inert Gas

AC Manual Electrode

DC Manual Electrode

ONE MACHINE

...FOR ALL MANUAL ARC WELDING APPLICATIONS

Now for the first time, users of arc welding can obtain a machine tailored to their own specific needs at the low cost of volume production equipment.

Two 300 ampere models, AC and AC/DC, can be equipped with High Frequency with gas and water controls, or any other feature required, at the factory. The buyer is free to select only those features he needs, thereby eliminating needless expense of purchasing unnecessary capabilities.

BASIC EQUIPMENT

The heart of the Idealarc TIG welder is a completely new saturable reactor transformer welder with plenty of capacity and exceptional arc characteristics. It is an excellent AC arc welder capable of handling a wide range of AC arc welding applications. This straight AC Idealarc is known as Model TIG-300.

The TIG-300/300 AC/DC Idealarc is actually the same high-quality AC welder with rectifiers, line contactor and other necessary circuitry added. This model has the same excellent AC welding characteristics, plus DC—at the flip of a switch.

The following features make either type Idealarc TIG welder an outstanding machine.

SELECTOR SWITCH

The selector switch on the combination AC/DC models has DC+, DC− and AC positions. A new design, it is rugged and capable of standing heavy use under severe conditions.

CONVENIENT CURRENT CONTROL

A selector switch divides the TIG's 10 - 375 ampere output into three easily adjusted narrow ranges:

	Position 1	Position 2	Position 3
AC amps.	10 to 75	40 to 250	125 to 450
DC amps.	10 to 70	45 to 250	170 to 375

A rheostat control provides fine tuning within each range. Further, all machines accommodate remote current controls.

OVERLOAD PROTECTION

All AC/DC Idealarcs and all straight AC's equipped with line contactors have built-in overload protection. This prevents damage to the welder from excessive heat in the windings or rectifier, regardless of the source of heat.

INDICATOR LAMP

A red light provides a visible signal that the welder is turned on. This lessens the chance that the machines will be left on overnight or over the weekend when they should be turned off.

RECESSED CONTROL PANEL

The entire face of the machine is recessed to prevent accidental damage to the controls. Output studs are recessed still further to give added protection against accidental short circuits across them.

STRAIN RELIEF LOOP

A rugged strain relief loop under the output terminals restrains excessive tension on the cable to prevent loosened contacts, arcing and cable overheating at the studs.

AMPLE COOLING

A large fan forces quantities of clean air from the top of the welder down over rectifier stacks and windings and out the bottom. This provides ample rectifier cooling without sucking dust and dirt from the floor through the machine.

Every "Idealarc TIG" Welder Has All These Features

Basic Price
AC Only $360 AC/DC $625

CONVENIENT MAINTENANCE

Maintenance personnel really appreciate the accessibility and ease of maintenance of the Idealarc TIG models. The sides of the machine remove easily and individually for routine inspection and cleaning. All parts are readily accessible.

SINGLE PHASE POWER

The Idealarc TIG welder can be used on any type of AC power source because it is a single phase machine. It is not limited to three phase power supply.

CONNECTS TO TWO VOLTAGES

All TIG model welders for 220/440 volts or 220/550 volts are reconnectable. On machines with line contactors this is done without changing any leads by merely moving a contact plate. The panel automatically reads the voltage for which it is connected.

OPTIONAL EQUIPMENT

Optional equipment converts the basic TIG-300 or TIG-300/300 Idealarc welder into a deluxe machine for all types of tungsten inert gas welding. Other features provide added convenience in using the machine. All may be factory-installed as integral parts of the machine and some are also available as a kit for field installation.

HIGH FREQUENCY And INERT GAS CONTROL

This feature provides all controls necessary for any tungsten inert gas welding. It can be set to operate in any of the following ways with either AC or DC:

Select Any or All These Optional Features

Price Including All Options
Except 115V Pushbutton and Undercarriage
AC $816 AC/DC $1041

1. High frequency, continuous during arc time, with gas and water control.
2. High frequency for arc start only, with gas and water control.
3. No high frequency, but water and gas control.
4. No high frequency, no water and gas control.

Two switches provide the above choices. The first is a master switch that turns the whole high-frequency unit, including gas and water controls, on and off. When it is in the "on" position, the second switch selects continuous spark, start-only spark or no spark without affecting the gas and water controls.

A timer adjusts the gas and water after-flow time. It is set according to electrode size.

There is no welding power or high-frequency output, except when welding. Cable and torch are electrically, "cold" and safe. To weld, the operator depresses a remote switch which attaches to the torch. This closes an output contactor to apply high-frequency and welding current. When the arc is extinguished, the contactor opens automatically.

† Zone 1 Prices

REMOTE CURRENT CONTROL

With the convenient Amptrol remote current control, operators adjust current while welding to compensate for varied welding conditions and for crater filling. It controls current from minimum amperage of the range set on the machine to the maximum amperage set on the fine tuning control. It comes with 25 feet of electrical cord and a three-pronged plug which fits the receptacle on the welder. Amptrol is available in either hand- or foot-operated models.

BALANCED WAVE FILTER

Recommended when an AC high frequency is used, the filter eliminates the distorted wave shape and DC feedback current created by the arc. It provides smooth operating characteristics over the entire current range and maintains the machine's rated output at 50% duty cycle. It includes three, 6-volt automotive storage batteries and a trickle charge circuit to keep them fully charged. Equipped with a switch, the trickle charge can be turned off when not needed. A quickly detachable (QD) connector is provided to take batteries out of welding circuit when not required.

POWER FACTOR CORRECTION CONDENSERS*

Power factor condensers improve power factor and reduce input current. With them, it is possible to install lighter input leads and reduce KVA power demands.

LINE CONTACTOR

You start the Idealarc TIG with a pushbutton on the front of the machine. This operates a magnetic contactor type starter, which is connected to provide overload and overheating protection for the rectifier and windings. The line contactor is standard equipment on AC/DC models; optional on straight AC models.

115 VOLT PUSHBUTTON CONTROL

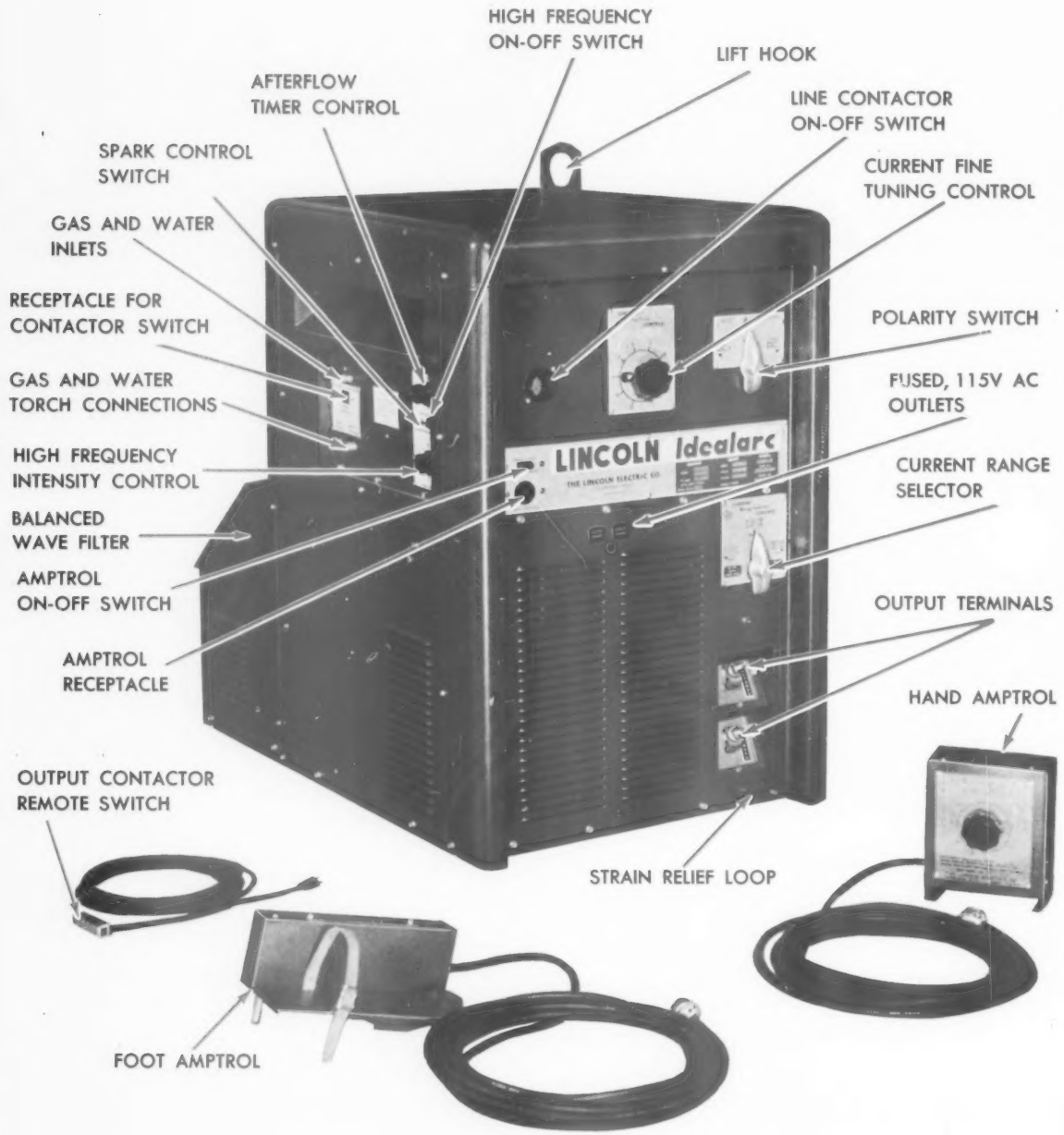
This feature modifies the pushbutton circuit on the line contactor so it meets special safety regulations which require that pushbuttons operate only in 115 volt circuits.

UNDERCARRIAGES*

Heavy duty, three-wheeled undercarriages provide convenient portability for machines that frequently move from one place to another in the shop. Available with either steel or solid rubber tired wheels, the undercarriage pulls easily and requires little extra floor space beyond that required for the welder itself.

* Available in a kit for field installation.

Lincoln "Idealarc TIG" Arc Welder



FOR ALL MANUAL ARC WELDING APPLICATIONS

APPLICATIONS

Idealarc TIG welders are exceptionally versatile welding machines. No other welder offers all the features available on these Idealarcs. No other machine can do so many arc welding jobs.

First, Idealarc TIG welders are especially applicable to tungsten inert gas welding of aluminum and other newer metals with AC and high frequency. The output characteristics are designed to provide an even wave shape that produces best arc characteristics and cleaning action. The wave filter automatically maintains these characteristics over the entire current range. This filter is the most simple and effective means of controlling the DC component in use today.

All necessary controls for tungsten inert gas welding are integral parts of the high frequency package. Smooth remote control, so necessary in crater filling, is available. In short, Idealarc TIG welders have everything required in a machine for AC, high frequency, inert gas welding.

Further, direct current with high frequency is used for tungsten inert gas welding of stainless and some alloy steels. Idealarc TIG welders are ideal for this type of work too. Again, they have everything necessary to do the job.

In addition, Idealarc TIG is an excellent machine for all conventional, coated electrode, applications. AC or DC, convenient controls, good arc characteristics, ample current range, and many other features provide plenty of operator appeal and outstanding welding performance. Job shops and maintenance departments particularly appreciate the ability to handle, with one machine, both their routine work and the aluminum or other special jobs they encounter.

Idealarc TIG is truely an exceptionally versatile machine for both inert gas and conventional electrode welding.

(Note: If your welding requires only conventional coated electrodes, see Bulletin 4607.1 which describes the model TM Idealarc welder.)

SPECIFICATIONS

Model	TIG-300	TIG-300/300
Type 60 cycle	K-1130	K-1131
50 cycle	K-1132	K-1133
NEMA Output		
Amperes	300	300
Arc Voltage	40	40
Duty Cycle	60%*	60%*
Output Current Range		
AC	10-450 amps.	10-450 amps.
DC	....	10-375 amps.
Input Current (on 220V and at rated output)		
With Condensers	84 amps.	92 amps.
Without Condensers	108 amps.	108 amps.
Weight (Approx.)		
Net	630	760
Shipping, Domestic	680	820
Shipping, Export	800	950

INPUT POWER

Volts:	208, 220/440 or 220/550
Phase:	Single (or any one of 2 or 3)
Cycles:	60 or 50
Special Voltages:	220/380 and other single voltages available at slight extra charge

DIMENSIONS

	Height	Width	Depth
Machine, overall	44⅞"	26⅛"	28½"
Export crate	59⅝"	35¼"	37⅞"
Mounting Holes (centers, ⅝" x ⅞" slots)		28⅛"	14½"

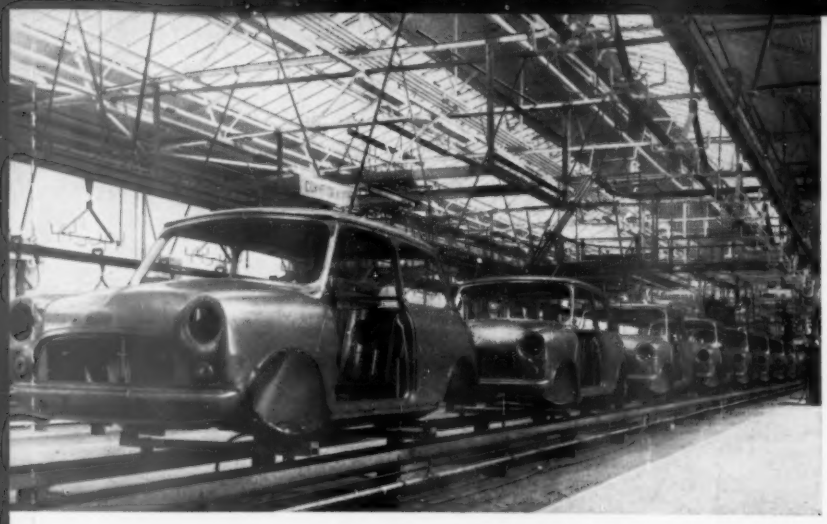
* On AC inert gas applications this is reduced to 50% when using wave filter and to 35% without aid of wave filter.

LINCOLN ...USA

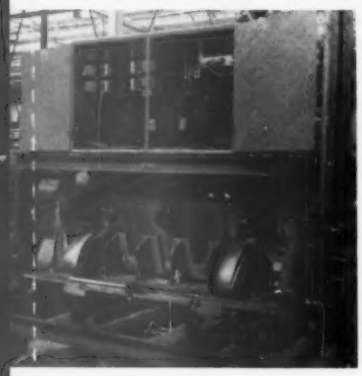
THE LINCOLN ELECTRIC COMPANY

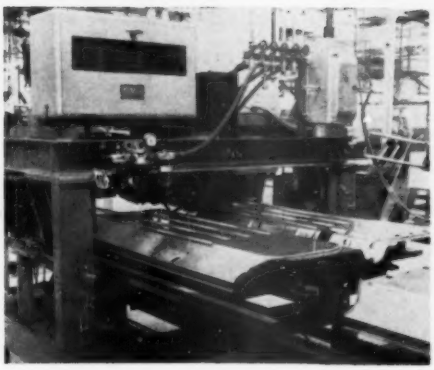
The World's Largest Manufacturer of Arc Welding Equipment!

CLEVELAND 17, OHIO



MULTI-SPOT WELDERS play an important part in high speed assembly of the British Motor Corporation's 850 c.c. Austin Seven.





TYPICAL WELDERS include one which welds the rear seat panel to the rear wheel arches by making eight spot welds on either side (right) and large unit which welds the heel board and seat cross member to the floor pan of Austin's new baby car (far right).

AN OVERSEAS REPORT

Multi-Spot Welders Help Turn Out 3,000 British Economy Cars A Week

IN BRIEF: Specialized resistance welding equipment, including six different multi-spot welders, have special locating and holding fixtures and air-operated ejectors to insure speed and accuracy of welding.

MULTI-SPOT WELDING MACHINES speed up production of the British Motor Corporation's 850-cc. Austin Seven economy car. They expect to make, at peak, over 3,000 a week.

DESIGNED FOR ECONOMIC WELDING

They had to design their engine mountings and chassis frame for the most body strength with the least body weight. The designers specified an all-steel body for two reasons: The chassis, two subframes, one in the front and one at the rear, is an integral part of the body. Austin needed specialized resistance welding equipment to build it. To spot weld the two subframes, they use six different multispot welders. Each have locating and holding fixtures with air-operated ejection mechanisms.

Electro Mechan-Heat Ltd. built the welders. By sequence welding, all will give a maximum of 1,000 amps at 400 volts. By using tandem air cylinders the welders can place their spots at 2-inch intervals. Used with a 90 psi air line, cylinders produce electrode tip pressures of 400 psi.

IN LINE PRODUCTION:

First Subassembly: A multi-spot welder attaches the rear seat panel to the rear wheel arches making eight spot welds on either side. This machine has four 75 KVA packaged transformers connected across the 3-phase power supply. An electronic control fires the first two transformers together, the others one at a time. A 5-stage weld sequence timer switches on the

Continued on page 48

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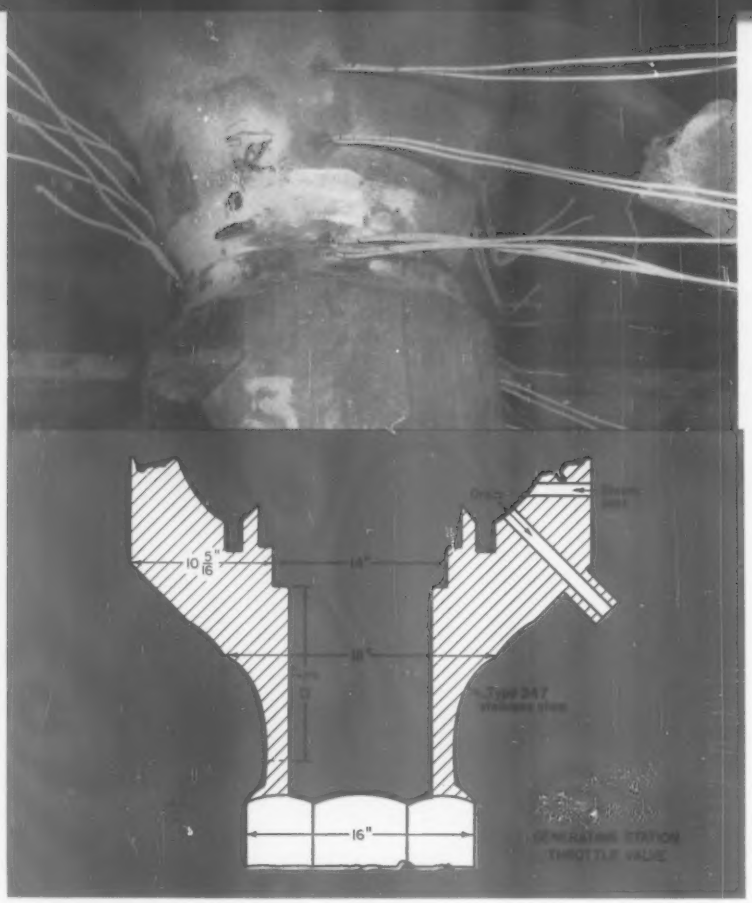


EXACT MEASUREMENT of heating and cooling rates during heat treatment was done with thermocouples welded to critical valve zones. Rates were important in the restoration of ductility to the brittle Type 347 valve so that welded repairs could be made.

On-The-Job Heat Treating Used In

by **JOSEPH L. McPARLAN and MICHAEL J. RYAN,** *Consolidated Edison Co., New York City*

IN BRIEF: High pressure steam valves made of Type 347 stainless steel had to be repaired because welds had become embrittled. On-the-job induction heat treatment restored ductility, permitted high quality repair welds to be made.

THERE ARE 74 WELDED JOINTS in the stainless steel steam leads of Consolidated Edison's No. 10 turbine generating station in New York City. Fourteen are field welded, the rest shop welded. We put No. 10 into service in 1951. By now most of the joints have cracked, some seriously.

During shutdown for general overhaul in 1954, we found only 11 of the joints free from cracks. Twenty-three of the defective joints showed surface indications. We cleared them by grinding. On the other 40 defects we had to remove a lot of metal and restore it to its original thickness with new weld metal.

DESIGN CONSIDERATIONS

Gradual embrittlement of weld metal in Type 347 stainless steel has troubled utilities. Many use it in main piping in their high pressure, high-temperature steam systems. Overcoming the embrittlement often requires unusual welding and heat treating.

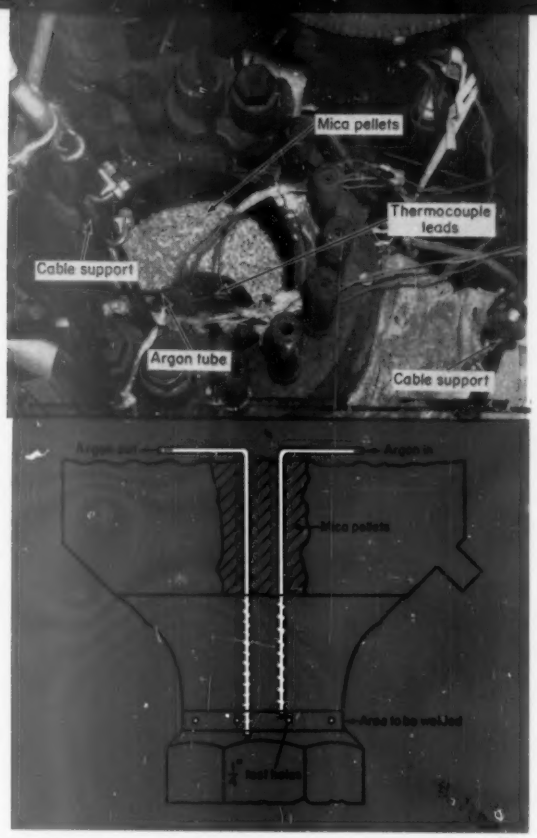
For the original design, we picked Type 347 for the No. 10 turbine. This is a chrome nickel stainless steel with columbium added. We picked it because of its superior mechanical properties and high corrosion resistance in the 900°-1600°F temperature range. Steam at the No. 10 inlet is 1450 p.s.i. and 1050°F.

The 347 steel is so strong one can use 8-inch, Schedule 160 pipe with an 0.891 inch wall. Rigid, heavy-wall piping would have needed a lot more space. The schedule 160 pipe gives us flexible piping and helps reduce thrust and twisting on the turbine shell.

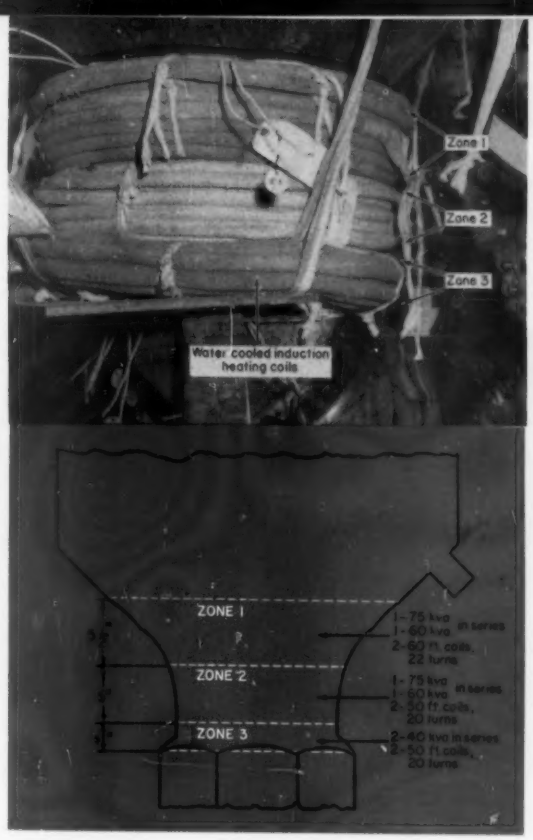
Despite 347's good overall performance, the weld metal became brittle. Besides loosing ductility and impact strength, serious parent-and-weld metal cracks developed next to the joints. There's a good chance we'll replace the austenitic Type 347 piping with pipe made of ferritic material.

We went through the same thing in 1957, 17 joints needed grinding, 43 required rebuilding.

Finally, when we took No. 10 from service in January, 1959, to replace the turbine spindle. We made another inspection. We checked the steam lead welds



DURING HEAT TREATMENT valve was protected from oxidation with argon gas fed into it. Heat was held in the thick stainless steel by asbestos paper outside; mica pellets inside.



SOURCE OF HEAT for on-the-job solution treatment of the embrittled valve was six induction heaters. Units were paired to give each zone enough heat; heat was inducted by coils.

Repair Of Brittle Stainless Valves

by the dye penetrant method. We found 75 defective joints, 40 of them requiring the removal of metal and rebuilding. The joints under the two throttle valves, below the turbine, were bad. It took a lot of elaborate welding and solution treatment procedures to repair them. The valves are large; biggest maximum O.D. about 36-inches.

SOLUTION-TESTING LEFT VALVE

The joint under the left stop valve was badly cracked. Worse yet, it was too brittle to be repaired by welding because of the high free-ferrite concentration—17%. Maximum desirable concentration is from 2% to 3%.

Before we could weld this joint, we had to put the ferrite back into solution. It was next to impossible to remove the valve to the shop for heat treatment, so we did it on the site with portable equipment from Electric Arc, Inc. It took us less than 12 hours.

First, we cut the valve free from the steam leads. We hung it in cables and turnbuckles, and checked weight with dynamometers. We slid a sheet of Transite in the cut portion of the steam lead, ahead of the valve to separate the butt ends.

In the area to be heated we welded 20 thermocouples. We spotted them on the outside of the valve at 90° intervals around the perimeter, 180° inside.

The valve's mass and volume varies in the affected section. The outside diameter reduces from about 20 inches to 14 inches, and the wall thickness tapers too. So we had to control the metal's heat in three zones. We did it by wrapping three independently controlled, water-cooled induction heating coils around the valve stub. The coils are rated and fused at 1200 amps. Transite pipe was used to support the heating coils.

The six induction heaters were supplied by two 600-amp. 440-v AC feeds, each leg sized at 500 MCM. The cables from the coils were also 500 MCM.

To contain the heat within the massive valve, we wrapped it with six layers of asbestos paper after we joined the thermocouples, and before we wrapped the coils around the valve stub. We also filled the valve cavity with mica pellets.

We fed argon into the interior to prevent oxidation during heating (See sketch).

The heat treat schedule was as follows:

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NEW PIPE SHOP LAYOUT (above) helps speed welding. Incoming plate is shown (lower right); welding jigs are in background (left and right); water tests are made at exereme lower left.

WELDING HEAD traverses a longitudinal seam inside a pipe section (right).

Special Automatic Set-Ups Speed

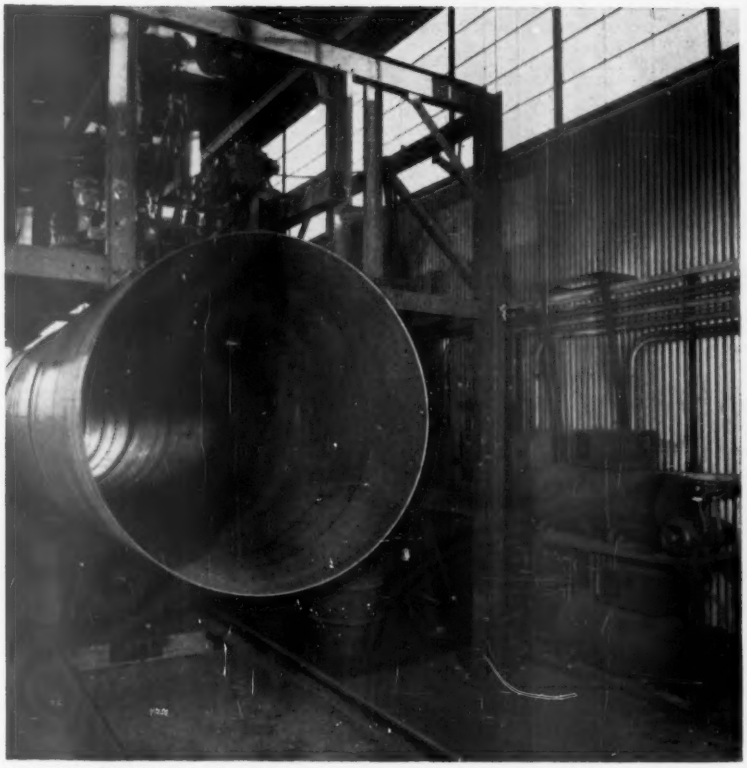
IN BRIEF: Special set-ups help this company meet delivery deadline and make welds that meet specifications of the American Water Works Association and the American Society of Mechanical Engineers.

AUTOMATIC WELDING on a mass production basis helped us meet delivery deadlines on 2,125 sections of 78-inch diameter welded steel water pipe. We did this job recently for the city of St. Louis. The 18-miles of pipe was evenly divided between ½- and ⅜-inch plate. A length of the pipe (42-feet) made from ⅜-inch plate weighed 11,760 pounds. A length made of ½-inch plate weighed 17,500. In all, we used almost 17,000-tons of steel.

We did the work on special set-ups in our new plant. Each 42-foot pipe section has seven cans 6-feet wide joined by inside and outside circumferential welds. These welds meet specifications of the American Water Works Association and the American Society of Mechanical Engineers. We roll formed the cans from squared and trimmed plate sections. The longitudinal and circumferential seams were welded automatically inside and out.

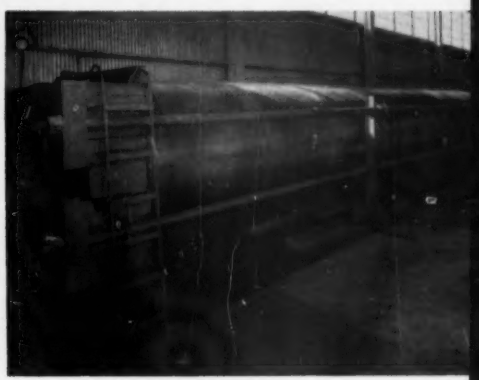
Here are some of the statistics: Each 42-foot section has six 20.4 foot circumferential welds. Thus, the 2125 sections meant a total of about 14,000 such welds. We needed 261,990-feet to hook up the nearly 15,000 individual cans. Longitudinal welds run to 89,250 feet for a grand total of 351,240 feet. Remember that seams are welded inside and outside. This gives us a total weld footage of 702,480 feet.

We used all square butt welds. We made these with a single 7/32-inch mild steel wire and Lincoln Electric LAF-3 automatic heads. We mounted the heads on a traveling boom for inside welds. On the outside we used automatic heads in tandem. The tandem set-up was unusual. It had a LAF-3 automatic DC head operating at 1200-1500 amps, followed by a LAF-4 automatic AC head, operating at 500-700 amps. Speeds on the two tandem units ranged from 50 to 90 ipm. We made cross seam adjustment by using a reversing switch on the head travel carriage. We could inch the heads slowly in either direction across the seam. We



OUTSIDE WELDS are made with pipe sections mounted on special rail car with power-driven rollers. Dual tandem head automatic set-up travels along a rail positioned at about top center for longitudinal welds.

by **RICHARD J. CASEY,**
Welded Steel Pipe Co., St. Louis, Missouri



FINAL TEST is made with water pressure at 280 psi.

Welding Of 18-Miles Of 78-Inch Pipe

used a spotlight attachment to light electrode points for the operator.

To allow for any slight movement of the pipe under the arc, we pivoted the two heads at the bottom of the lift adjuster. We used a rubber-tired swivel roller to hold them at the proper distance from the weld. Thus, we could raise or lower the heads as required by any up and down movement of the pipe as it turned under them. This maintained the exact flux depth at all times. That's how we maintained proper bead shape and got full penetration.

Our boom fixtures made longitudinal and circumferential joints for inside welds. After attaching one can to the end of the section, we rolled the section along the conveyor of the fit-up jig and another can dropped in place for welding. We repeated this procedure until seven cans were tied together. Then, we hoisted out the entire section and moved it to the nearby outside welding jig. For outside seams, we mounted the pipe on a low car traveling on rails. Power-driven rolls mounted on the car turned the section under welding heads.

We checked weld quality by trepanning out sections at regular intervals, and examining the penetration. Interestingly enough, we found the overlap of outside DC and AC welds made on the tandem heads was excellent. A flat-bottom weld is characteristic of the tandem arc. This minimizes any tendency for separation between the two heads.

Our equipment layout permitted continuous flow of the pipe sections—with no backtracking. We removed incoming plate from the receiving dolly with a vacuum-cup hoist. Then we transferred it to a press to crimp the ends before rolling. From the press it went directly into power rolls for forming the circular shape, then to the fit-up jig for inside welding. Then the section was placed on the roller car and moved into the outside welding jig. From there, the sections went to a repair station, a water-testing rack, and finally to an assembly station where we attached fittings and back-up bars.

In the water test, we clamped heads at either end of the jig against the section. A pressure of 280 psi checks the soundness of weld and plate. Four heavy 4-inch alloy steel longitudinal rods on the jig restrain end pressure which totals nearly 1,300,100 pounds. • •

Vacuum Brazing Of Stainless Honeycomb Panels Solves Oxidation Problem

IN BRIEF: New equipment speeds production; look for its use on other oxygen-sensitive materials such as titanium, molybdenum and beryllium.

PRODUCTION-SCALE VACUUM BRAZING of honeycomb structures? Grumman Aircraft Engineering Corp. will do it at Bethpage, New York, on equipment from F. J. Stokes Corp., Philadelphia. Grumman will braze panels bigger than 50 square feet. They will fabricate structures for the "Eagle" air-to-air missile. This project was recently disclosed. The Eagle is being developed by the U. S. Navy's Bureau of Aeronautics. Grumman holds a major subcontract from Bendix Aviation Corp. for the airframe, propulsion system and ground-handling equipment.

ADVANTAGES

Announced late in 1958, this new Stokes-Bukata process eliminates the need for expensive welded envelopes to enclose the work. This makes for rapid loading and unloading of panels. The extremely high-vacuum avoids the need for costly inert shielding gases.

Why use a vacuum instead of inert gas? A. D. Garwood, manager of Stokes' Vacuum Metallurgical Department, answers. He says, "Both the core and the skin in stainless steel honeycomb structures are oxygen-loving materials. These are very quick to form oxides that prevent making a good bond. The use of inert gas, such as argon, merely substitutes a non-reactive molecule for an air molecule. These inert-gas molecules contain a certain amount of impurities no matter how elaborately the gas has been dried. These impurities in turn contain enough oxygen to produce unwanted oxides. On the other hand, a vacuum is truly inert. It's the best you can get per dollar of capital investment. Furthermore, argon gas is expensive. Consumption of argon at one brazing installation is said to cost as much as $50,000 a month."

Preliminary work shows the Stokes-Bukata process offers other advantages. One is that the combination of elevated temperatures and high vacuum removes

continued on page 48

PILOT-SCALE EQUIPMENT brazes test-size honeycomb panels. Cylindrical chamber rolls horizontally on twin rails and opens for loading by moving to left. Then, it closes against fixed end-plate for evacuation.

TACKED SANDWICH is put on reference-base block of graphite. Heating elements extend across the lower heating tray. Duplicate heating elements are in upper heating frame mounted within the chamber.

COVER SHEET is placed over honeycomb panel. O-ring gasket running around perimeter of water-cooled heating frame forms a vacuum-tight seal with this cover. A similar sheet and O-ring are located beneath graphite reference base. Together, they form an "envelope" completely enclosing the panel.

CHAMBER IS CLOSED against fixed end plate and envelope is evacuated. Hydraulic cylinders force the upper heating frame down onto the cover sheet, compressing the O-ring gaskets and sealing the envelope around the honeycomb panel.

NEW!

AO COVERGLAS GOGGLE FITS 99% OF WELDERS

Meet the new AO 329 Welders' Coverglas Goggle — with a wide range of vision and fitting ease.

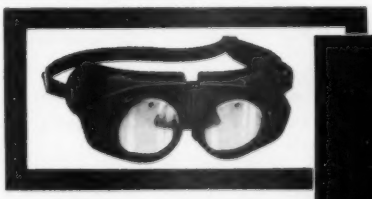
Designed to exceed government specifications, the 329: (1) Fits over all types of correction spectacles, including those with decentered temple pieces. (2) lenses measure 50 mm. round.

In addition to offering superb fitting qualities proven by tests, the 329 simplifies lens stocks since it accommodates 50 mm. rd. lenses used as standard in all other type cup goggles regularly used. (Users prefer a large cover goggle with 50 mm. rd. lenses.) Also, the goggle has increased ventilation and a more attractive appearance.

The 329 protects against injurious light radiation, glare and flying sparks. A companion chippers' model (325) is identical except for its direct ventilation and clear lenses. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

- Solid fiber lens retaining rings prevent light leaks.
- Indirectly ventilated side louvers.
- Filterweld No. 5 shade lenses standard.
- Adjustable leather bridge. Also available with rigid bar bridge as 329B and with adjustable rigid bridge as 329R.
- Frames are cellulose acetate, opaque brown.



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VACUUM BRAZING

continued from page 46

many surface contaminants by evaporation.

The pilot-scale prototype equipment shown in accompanying photographs is in regular operation in Stokes' laboratory. They've made qualification panels (one- by two-feet) and have furnished them to aircraft manufacturers. According to Mr. Garwood, these test panels are of unusually high quality. This quality is measured by the completeness and uniformity of the bond between the core and the skin.

At first, the equipment will operate at 1750° F. This is high enough for all honeycomb work now. But, if can be used successfully at temperatures above 2100°F. Once brazing material has been fused, work can be cooled in the equipment. This is desirable with precipitation-hardening honeycomb materials, such as 15-7 Mo and 17-7 PH stainless steels.

Stokes and Stephen Bukata, the process inventor and consultant on honeycomb brazing are optimistic. They feel the process will work newer honeycomb materials where oxygen sensitivity is even greater. These include titanium, molybdenum and beryllium. • •

RESISTANCE WELDING IN ENGLAND

continued from page 41

three ignitron contactors mounted inside the control cabinet. This gives three weld sequences, a forge time cycle, and an interlock stage. They pneumatically clamp the parts in position in a hand-operated trolley. Next: The cycle continues and pushes the trolley forward to the welding position. It locks in place pneumatically and the weld cycle starts automatically.

Second Subassembly: A multispot welder attaches the rear floor panel to the rear wheel arch, and seat panel assembly. Again 8 spot welds are made on either side. A pneumatically-operated table built into the unit provides an easy to work on table surface for loading. It also acts as an automatic ejector. The station uses the same type electronic unit.

Third Subassembly: A multi-spot welder with two 75 KVA packaged transformers, tack welds four seat hinge brackets and two boxing plate angles to the U-section front seat cross member. The operator indexes the machine's manually operated table through six welding positions. The positions are selected pneumatically. The hinged lower blocks are particularly interesting. These flap into place inside the ends of the floor cross member. Then they attach two boxing plates to them. Each electrode block is cut away so two welding guns can descend vertically to make a series of welds. Two more guns close in from either side to make a series of welds in the sides of the cross member. The welding current is carried across the U-section on the electrode block. The seat hinge brackets are located and fastened by direct welding. The timing unit has three 2-stage timers. Two control the weld and forge times. The third acts as a builtin spare.

Fourth Subassembly: A large multi-spot welder has a pneumatically operated table and dieset that holds the floor pan of the car body. The front seat crossmember and the heel board assembly are attached

HI-AMP

ELECTRODE HOLDERS
CABLE ATTACHMENTS
GROUND CLAMPS

Offers

T.P.C.*

* THREADED POWER CONNECTION

Excessive heat in a welding circuit is oftentimes caused by a resistance build-up at some point in the welding circuit due to connections being loose or oxidization setting up in a mechanical type of terminal connection.

Shown in the above "cut-a-way" picture of an Electrode Holder is the new HI-AMP, T.P.C. type of connection that can be adapted to ground clamps and quick disconnect plugs as well as to electrode holders.

T.P.C. means a Threaded Power connection using the pressure of threads on a sleeve to drive the ends of any welding cable down into the depth of a cable socket, then locked into place with threaded plugs. An excellent electrical connection as well as providing direct contact with the welding cable to the accessory so that maximum heat is conducted into the heat-absorbing cable.

ASK YOUR WELDING SUPPLY HOUSE FOR FURTHER INFORMATION

354 W. ADAMS ST. LENCO, INC. JACKSON, MO.

For More Information Circle No. 38 on Reader Service Card.

to the pan by 82 spot welds.

Two welding trolleys, one on either side, are automatically indexed to the welding position, using air motors attached to the trolleys. Sprockets on the drive shafts of the motors engage with lengths of chain fitted between the trolley tracks to provide a rack-and-pinion movement. The pneumatic circuit is arranged so only one trolley will operate at a time. When the trolley reaches the welding position, 82 guns descend simultaneously. Through a 4-sequence contactor arrangement a specially designed timing unit selects in turn three banks of six 75 KVA transformers and one of three transformers. The electronic control ensures that no more than two transformers are fired at any one time.

Fifth Subassembly: Another large spot welder with a welding trolley similar to that used in the fourth station welds the heel board and seat cross member to the floor pan in the curve of the transmission tunnel only. Here also, an air motor indexes the trolley forward through six welding positions. The positions are selected by an electro-pneumatic circuit. The welding guns are crossed so groups of four spot welds can be made in pairs inside the small radius curve of the tunnel; they are also slightly offset to bring the spots exactly in line with the stiffeners.

Sixth Subassembly: A small multi-spot welder has a hand-operated table. This locates the four sections of the "radiator surround" and welds them together. During the work the assembly is indexed through four welding positions. • •

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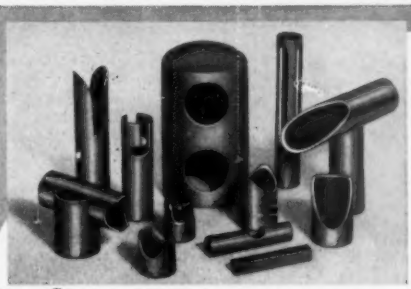

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ARC-SNUG prepares pipe ends for snug brazing—up to 500 pieces per hour.

ARC-TWIN® double notches pipe up to 750 pieces per hour.

CUT-OFF shears tubing in two up to 2000 per hour.

Samples of shearing and notching (also estimates) gladly furnished without obligation.

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P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.40 per gallon, f.o.b. Dayton.

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Money-Back Trial Offer. Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

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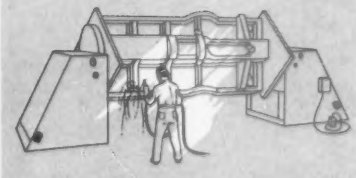

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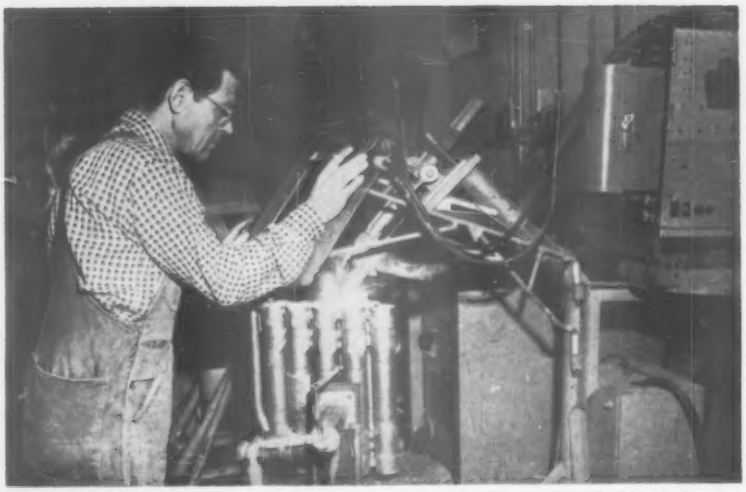

MECHANIZED WELDING installation joins caps to barrel ends of a fuel-to-oil heat exchanger at a speed of 60 ipm.

HEADER PLATE is welded to regulator assembly at speed of 85 ipm, cutting production time from 40 to 10 minutes.

Switch From Manual To Automatic Welding Boosts Production 400%

by **L. M. REESE**, *welding foreman, Airesearch Mfg. Div., Garrett Corp., Los Angeles*

IN BRIEF: Mechanized inert-gas consumable-electrode process speeds welding of aluminum components for aircraft and missiles.

A SWITCH from manual to automatic welding increased production of aircraft and missile components by over 400 percent. Where? At Airesearch Manufacturing Division of the Garrett Corporation, Los Angeles. For example, take their production of fuel-to-oil heat exchangers. It increased from 8 to 35 a day. Oil-temperature regulators are another example. Production of these increased from 12 to 48 a day. The reason for this improvement? A switch to the mechanized inert-gas consumable electrode welding process.

HEAT EXCHANGERS

They are made of ten 17-inch long,

continued on page 54

NEW LOW COST HEAVY-DUTY NO. 25 REGULATOR

Harris offers a new low cost regulator which out-performs much higher priced regulators.
The No. 25 regulator will pass 2000 cubic feet per hour with only a 2 lb. drop from no flow to flow, enough to cut steel 14 inches thick.

FEATURES:

1. Extremely simple to repair.
2. Large 2¾" diaphragm assures accurate pressure regulation.
3. Soft valve seat insures positive shut-off, virtually no crawl.
4. Light weight and heavy duty.

MODEL	GAS DELIVERY	MAX. FLOW	PRICE
25	Ox. 0-80	1500	$20.75
X25	Ox. 0-180	2000	20.75
25P	Ac. & Prop. 0-25	400	19.25
25D	Ac. & Prop. 0-25	400	19.25

For more details, see your nearest Harris distributor or write to us.

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Made of durable Ampco alloys, for (1) unusual hardness and toughness at elevated temperatures; (2) exceptional resistance to wear; (3) extra durability; (4) uniformly high electrical conductivity. You get longer service life.

An Ampco-Weld distributor near you can supply rough forged blanks *from stock* — and can give early delivery on wheels machined to your specifications.

RW-19

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Boyd Welding Co. Erie, Pa.
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AUTOMATIC WELDING

continued from page 52

⅛-inch diameter 6061 aluminum tubes. The entire assembly—with the exception of the tube end caps—is tack welded by the tungsten inert arc process. Then the assembly is dip brazed.

Then they join the caps to the barrel ends. They use Linde Company's SWM-2 Sigma welding machine. Adapted to fully automatic operation, this machine is equipped with an HW-13 torch.

First, they place the tube bundle on an indexing table which is controlled by a variable drive. The tubes index to the center of the table and rotate under the stationary torch. Welds are made with 3/64-inch aluminum wire at 150 amps and 18 volts, direct current and reverse polarity. All welds are shielded by 99.995 percent pure argon gas.

When caps were manually welded to the barrel ends, one unit an hour was considered good production. Mechanized welding at speeds up to 60 ipm slashed this time to only 13-¾ minutes. This means 437 percent increase in production.

OIL TEMPERATURE REGULATORS

These are 17-inch diameter regulators made of 1/16- to ¼-inch thick 6061 aluminum. External and baffle section of the shell are tack welded and dip-brazed. With the header plate placed over the shell, they position the assembly on the variable-drive turntable and rotate it under the stationary torch.

The argon-shielded welds are made with 3/64-inch aluminum wire. Current: 200 amps, 17 volts, direct current and reverse polarity.

Speeds of 85 ipm slashed production time on the regulators from 40 to 10 minutes.

QUALITY CONTROL

However, speed of welding is not the only requirement. These are aircraft and missile components. They must pass extensive tests.

For example, the fuel-to-oil heat exchangers must pass 1000 psi pressure tests.

The regulators are first given a 60 psi test with 300°F oil and cycled at six cycles per minute. Then they must pass a 50,000-cycle test for final qualification. • •

HERE'S HOW STILL ANOTHER MANUFACTURER JOINS STAINLESS STEEL TUBING:

He uses Handy & Harman's BRAZE 630

He's one of many manufacturers and fabricators who have found—to their lasting satisfaction—that Handy & Harman silver alloy brazing is the final answer to stainless steel joining problems.

Super-Donic Manufacturing Company, Atlanta, Georgia, manufactures "Dual Arm Transmissions" for the dental industry. Most everybody has—at one time or another—seen and/or felt this unit in operation.

It is fabricated of small diameter 304 and 316 stainless steel tubing and, in its assembled form, consists of some 17 separate brazed joints. Joints must be strong, corrosion resistant and neat-appearing.

Each of the 17 joints is hand-torch brazed with Handy & Harman BRAZE 630 wire and HANDY FLUX TYPE B-1. There's no question that this is a unique application. There's no question, either, that the application is stainless steel. The ease and economy with which this manufacturer solves his problems can be just as readily applied to *your* stainless steel joining problems.

Strength, production speed, electrical and thermal conductivity, gas and liquid tightness and low cost are *natural* benefits of silver alloy brazing. We think it worth your while to learn more about this remarkable metal-joining method—we'll be glad to send you any information you ask for. Handy & Harman, 82 Fulton St., New York 38, N. Y.

FOR A GOOD START: BULLETIN 20

This informative booklet gives a good picture of silver brazing and its benefits . . . includes details on alloys, heating methods, joint design and production techniques. Write for your copy.

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*Consumable electrode vacuum melted

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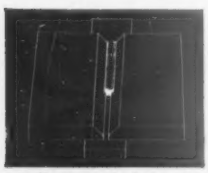

Easily removed when weld is completed

- Less skill required to produce better welds
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- Produce smooth, uniform bead on under side

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NEW ALUMINUM ALLOY

continued from page 34

SELECTION OF SPECIMENS

Researchers used mill production, ¾-inch thick alloy 5083-H113 temper plate. They picked -H113 temper because it is much stronger than plate in the annealed condition. Annealed plate would be at least as good as goldworked -H113 temper in resisting brittle fracture. They picked ¾-inch because it's most used in 5083 and because it needs multiple-pass welding, typical of field welding procedures.

The composition of both the test plate and the filler alloy 5183 used to weld it were within the specification composition limits.

Test plates were welded by the MIG process. A 3/32-inch filler wire and Argon shielding gas were used. Joint design was a 70 degree included angle V, having a 1/16-inch land and a 1/16-inch root opening. Three face passes were deposited and the joint back chipped. One root pass completed the point. The welds were radiographed and found practically free of porosity and inclusions. Imperfections were avoided in cutting test blanks.

Kaiser researchers demonstrated the effectiveness of the various tests in producing a ductile-brittle transition by running, at the same time, tests on plate and welds of typical-brittle material, SAE 1034 carbon steel.

Altogether, they ran fourteen test series on each alloy. Each series covered the —320 to 75°F temperature range. Tests were cut from the plate in both longitudinal and transverse directions; transverse to, and centered on, the weld; and, in the case of the notched impact tests, notches were located in the weld's heat-affected zone.

In the four types of tests discussed, a ductile-brittle transition was found under every set of test conditions in SAE 1034 steel. With the most severe tests, those involving impact loading and notches, the transition temperature zone of the steel plate was found to lie above 0°F.

No ductile-brittle transition was found in plate of aluminum alloy 5083-H113, or in its welds of aluminum alloy 5183, under any of the test conditions, at temperatures to —320°F.••

CAST-WELD CONSTRUCTION

continued from page 32

inch diameter electrode at 140 to 150 amperes, direct current reverse polarity. For best results we use a stringer or weaving technique. Our operators are instructed to hold the electrode 10 to 15 degrees off the perpendicular and direct the arc on deposited metal. We also have to strike the arc and feed the electrode rapidly with a medium arc gap. We chip and brush slag carefully between passes.

With this close procedure control and constant inspection, we get a sound homegenous weld in a hurry.

••

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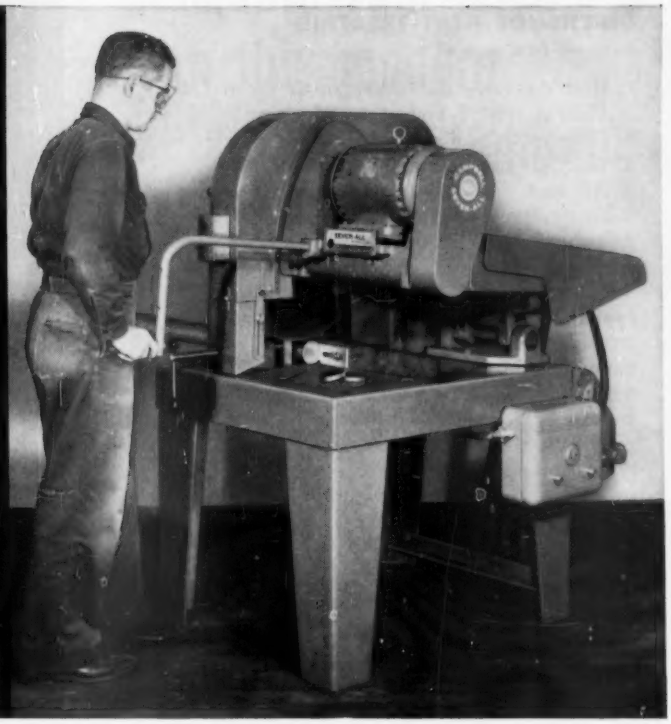
GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4″ round or square solids, 5½″ O.D. pipe or tubing, 6″x1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

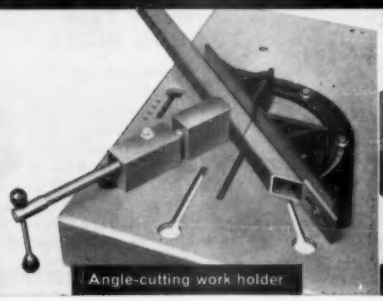
Safe • wheel guard provides complete operator protection.

Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

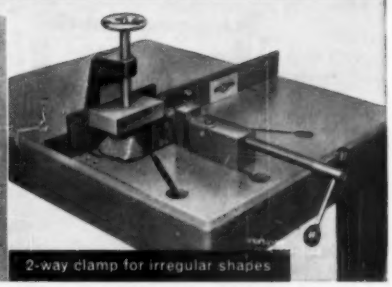
Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp



Angle-cutting work holder



2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

ACCO

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

925 Connecticut Avenue, Bridgeport 2, Conn.

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ON-THE-JOB HEAT TREATING

continued from page 43

1. Heat the valve stub—300°/hour up to 1100°F
2. Hold at 1100°F for two hours
3. Raise to 1900°F at the rate of 400 degrees/hour
4. Hold for two hours
5. Air cool.

Temperatures were to be maintained within ±25 degrees, and air cooling was to begin as soon as possible at the end of the two hour dwell at 1900°F.

A 5-man crew prepared the valve for heating and operated controls to keep the temperatures within ±25 degree limits. After a 2-hour soak at 1900°F, the crew stripped the valve of coils and insulation as quickly as possible and removed the mica pellets with a vacuum hose. They left the thermocouples in place to record the cooling rate.

When the valve had cooled enough we found the treatment had restored sufficient ductility in the steel so we could weld.

WELDING THE RIGHT VALVE

This joint under the right throttle valve had a history of accelerated crack development. During the January shutdown we found a full-depth circumferential crack on one side. To remove joint cracks, we ground several long trenches as deep as an inch.

This is how we made the welding repair:

Root, first and second layers of beads were applied by the tungsten arc method in argon atmosphere with Type 347 stainless steel filler rod.

INDUCTION HEATER and recorder shown here were used in heat treating Zone 2 of embrittled stainless steel valves before repair welding.

Third layer—Type 308 stainless steel rod.

Fourth layer—Manual uphand vertical welding with an electrode containing 16 Cr. 8 Ni and 2 Mo—designed to prevent crack formation in welding Type 347 stainless.

Fifth and following layers—Manual horizontal welding with reverse polarity, using the same electrode.

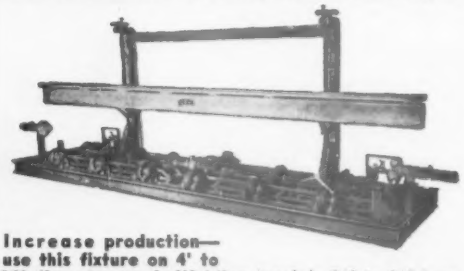
To avoid covering defects as the welding progressed, we polished each layer of weld metal and inspected for cracks. To avoid cracking the weld metal from temperature effects, we used various techniques, including buttering, and building up bumpers and buffers. The completed welds were blended to the O.D. of the adjacent pipe.

We repaired the left valve the same way. • •

WEBB TANK PRODUCTION MACHINERY

Horn Type Fixtures | Cylinder Flange Offsetters | Assembly Fixtures

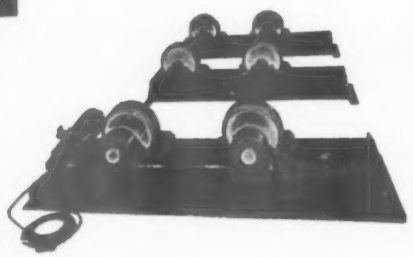
WEBB-REED TRACK SUPPORTS For Automatic Welding Head Carriages



Increase production—use this fixture on 4' to 12' diameter work. Welding track is 24' to 34' long. Powered vertical adjustment is available for all models. May be used with your present turning rolls, welding positioners, special jigs for straight seam work, or portable type rolls illustrated.

Unit Type Turning Rails | Portable Turning Rolls | Automatic Welding Track Supports

WEBB-REED Portable Type TURNING ROLLS



For manual or automatic welding and other operations requiring rotation of a cylindrical vessel. Capacities range from 3 tons to 75 tons; larger units built to special order. Powered by electric motor with variable speed transmission. Readily portable, they may be used free or anchored to the floor as desired.

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BRIDGE DESIGN

continued from page 30

made it necessary to X-ray. This would have increased the cost.

The three cowinners of the second honorable mention in the professional division ($5,000) explained in detail why they welded their two-span welded girder bridge. The winners—Douglas M. Fraleigh, William J. Jurkovich and Marvin A. Shulman of the California Department of Highways—said the simplest design is the best and almost always looks pleasing.

For economy, you need simple fabrication, simple erection. But, the contestants caution you must not stray far from present practices. Make your improvements in present fabrication methods, they say. And, don't design a bridge member that would have to be hammered out by an ornamental iron worker.

Fraleigh, Jurkovich and Shulman designed their bridge so all work necessary for assembly of the completed, ready-for-erection girder, is done in the fabricating plant. All of the welding (except the flange plate splice) is done by fillet welding in the horizontal position. This permits use of semi- or full-automatic equipment. High quality welds are easier to get in the shop than in the field.

The flange plates are narrow and thin, the web plate is shallow. So, no usually complicated jigs are needed and welding distortion is reduced.●●

U.N. BADGES

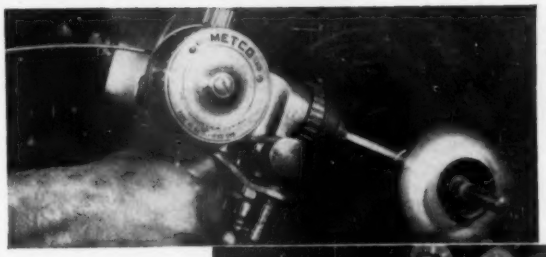
continued from page 14

ing alloy, utilizing the surface alloying process of metal joining, was used for the two difficult assembly operations without damage to the enamel. As a result, the badge order was completed in seven days and the badges were distributed to the UNEF advance troops in Egypt four days after they had landed.

The alloy which solved the problem was EutecRod 157, a product of Eutectic Welding Alloys Corp. The low application heat of this alloy prevented melting of the joint holding the pin when then enameled insignia was fastened on the opposite side of the badge.

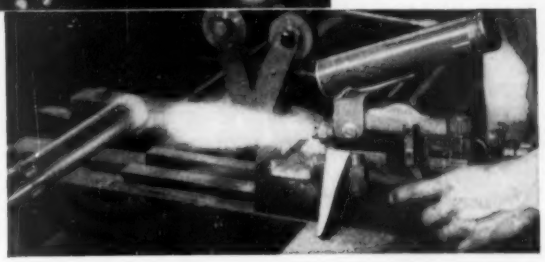
The alloy is applied with a torch at 430 to 500°F.

Complete your shop with this modern metallizing installation



WIRE GUN
Sprays any metal that can be drawn into wire form.

POWDER GUN
Sprays hard-facing alloys and ceramics in powder form.



Without metallizing no maintenance or "job" shop can offer the same complete service as the shop that uses industry's low-cost "putting-on" tool.

With modern, low-cost metallizing equipment you can spray carbon steels, stainless, babbitts, brass, bronze, nickel, aluminum, tin, zinc, special hard facing alloys including tungsten carbide.

- **Save up to 90% of replacement costs on machine repair jobs**
- **Do your own hard-facing at high speed, low cost**
- **Apply long-wearing, corrosion-resistant coatings**

A real opportunity for the smaller shop

Thousands of large, well-known companies and shops have been metallizing users for many years, not only in maintenance work but in production applications on original equipment. Now, with modern low-cost metallizing equipment this high-speed "putting-on" tool is within the reach of even the smallest shop.

FREE BULLETIN

Send off the coupon for detailed information — find out how a metallizing installation can pay for itself in a very short time. No obligation, of course.

Metallizing Engineering Co., Inc.
1179 Prospect Ave., Westbury, L. I., New York

Please send me free bulletin on metallizing.

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

METCO®

Metallizing Engineering Co., Inc.
1179 Prospect Ave., Westbury, L. I., New York · cable: METCO
Telephone: EDGEWOOD 4-1300
In Great Britain:
METALLIZING EQUIPMENT COMPANY, LTD.—Chobham near Woking, England

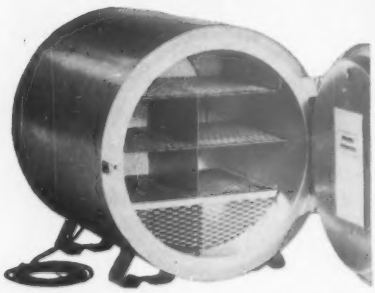
For More Information Circle No. 45 on Reader Service Card.

YOU CAN KEEP 'EM DRY

FOR 14c A DAY

Moisture-proof your electrodes at low cost with

DryRod® OVEN



Fourteen cents worth of electricity per day — that's about all it takes to operate the popular, Type 300 DryRod electrode oven. At that rate, and its low purchase price, you can't afford to be without DryRod protection against moist mineral coated rods. Insure your electrode investment against:

- **POROSITY** • **UNDER-BEAD CRACKING**
- **ROUGH WELDS** • **ROD SCRAP LOSS**
- **REJECTS** • **REWORKS**
- **PRODUCTION SLOWDOWN**

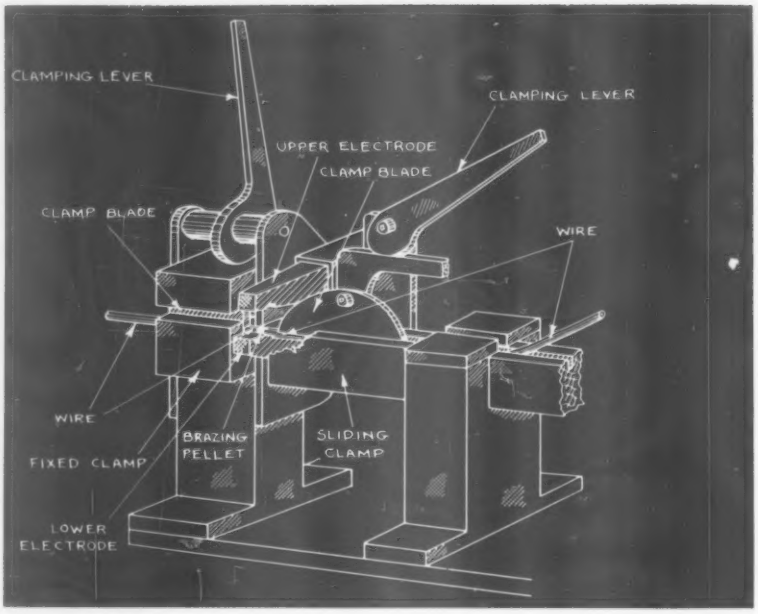
NEW! 800° or 1000° HIGH TEMPERATURE Re-baking Oven now available

The DryRod line of ovens now includes four basic models to meet every welding requirement.

Write for new folder "DryRod as Standard Welding Equipment".

PHOENIX PRODUCTS COMPANY
4731 N. 27th St. • Milwaukee 9, Wis.
Circle No. 48 on Reader Service Card.

HERE'S AN IDEA



New Electro-Brazing System For Solid or Stranded Copper Wire

IN BRIEF: A double clamp jig with carbon electrodes gets the best wire brazes ever because of firm clamping, and a follow-up action that brings the wire ends together as the solder pellet melts.

A NEW SYSTEM for electric brazing solid and stranded wire—particularly copper—has been developed by Rome Cable Corporation, Rome, N.Y.

Advantages are: Stronger, more flexible brazes, with a shorter annealed area, and no distortion of wire shapes.

The system uses two metal clamps, one on each side of the carbon-block electrodes. One, a fixed clamp, is separated from the electrode by a 1/64-inch air gap. The other is a spring-action sliding clamp which moves with the electrode groove, towards the other clamp.

To braze, one wire is inserted in the fixed clamp so that the wire end extends nearly half-way through the groove. A small pellet of brazing metal is placed next to the wire end.

The other wire is placed in the sliding clamp so that it lies in the lower electrode and touches the pellet. A stop holds the clamp a 32nd away from the electrode.

Next, the upper electrode is lowered to enclose the joint. The spring action of the sliding clamp presses one wire end against the pellet, which presses against the fixed wire end.

A shot of current melts the pellet; spring action follow-up brings wire ends together, and a strong brazed joint is made.

The spring clamp is adjustable to prevent bending of wire strands. Also, wires are firmly clamped so that they cannot "balloon." The chilling effect of the clamps restricts annealing to the short length of wire between the electrodes. This also prevents wicking of the solder from the braze area, thus assuring flexibility. There's less chance of mechanical failure with the strong brazes the system makes. • •

Turn to page 66 to see what other new products the welding industry will be using . . .

Medium Frequency (1200 TO 12,000 CYCLES) Induction Heating Equipment for Stress Relieving

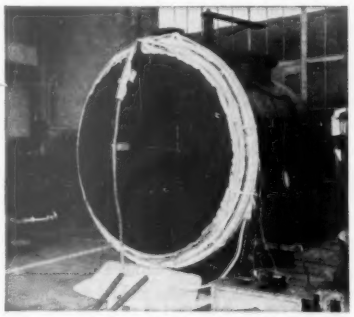
By Werner K. Haessler, Project Engineer, Brown Boveri Corp.

BROWN BOVERI

Brown Boveri manufactures turbine and generator shafts, precision marine gears and other products requiring flawless, stress-free weldments. After thorough testing, the Company adopted medium-frequency induction heating for stress relieving of weldments and for shrink fitting. Compact, mobile power-converters and special heat-resistant, insulated cable were developed . . . adding speed and flexibility to induction heating techniques. Standard sets are now available.

Advantages

Induction heating offers complete mobility not possible with furnaces. Even assembly welds at a customer's plant can be heat-treated. It generates the heat *inside* the metal as compared to furnaces or resistance heaters that heat from the *outside* using high surface temperatures. Thermocouple control allows more accurate adherence to prescribed temperature gradients. Simple cable and insulation arrangements cut labor cost. Cables and work can be covered with asbestos blankets to minimize radiation losses.



Cable arrangement for stress relief treatment of welded flange. Diam. 80", thickness ⅝", max. temp. 1148°F. Maximum power: 60 kw at 2.4 kc/s.

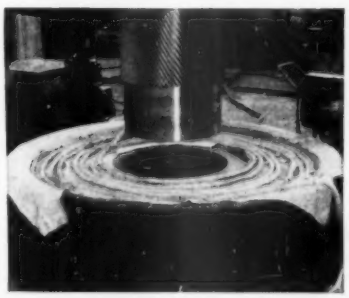
Medium frequency induction heating allows the use of relatively short and light cables with longer cable life. Since only a few turns are required, the energy is concentrated at the welding area allowing substantial power savings. The medium frequency system is adaptable for workpieces from 1/32" thick up to heavy forgings. (Low frequency systems, 50 to 400 cycles, require thick or very long cables and are limited to heating thick, heavy sections.)

Mobile truck for 38 to 110 kw output units. Larger units are also on a mobile chassis. Automatic temperature sequence control. Graph shows record of complete sequence.

Brown Boveri medium frequency converter sets

Frequency kc/s	Power kw	Voltage v	Input* kva
1.2	60	360	90
1.2	110	630	155
1.2	165	720	230
1.2	220	900	300
2.4	50	400	72
2.4	66	540	95
2.4	88	720	127
2.4	130	720	190
2.4	185	900	260
4.8	38	600	60
4.8	55	800	83
4.8	77	540	115
12	44	650	65
12	66	450	95

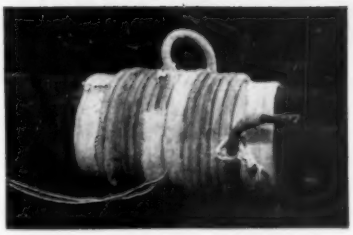
*3-phase motor input at 220, 440 or 500v, 60c.



Shrinking a gear wheel onto a shaft. The insulating blanket covering the cable has been removed to show the cable arrangement.

All sets are complete on a mobile, 4-wheel chassis. Plug and socket connections are supplied for connecting 2 similar sets in parallel for higher power. Drip-proof housing for outdoor exposure. Power and heat controls provide accurate, automatic heating, soaking and cooling periods with no supervision.

The complete range of Brown Boveri stress relieving units makes it possible to provide the frequency best suited for the specific size, thickness, composition and shape of the workpieces to be treated. In general, the lighter the workpiece, the higher the frequency. Experience has proved, however, that if one machine is to be used for a variety of applications, frequencies in the range of 2 to 2.5 kc are the most suitable.



Upper photo: Cable position during pre-heating at 850°F and welding. Below: Cable windings are simply pushed together and are ready for stress relief treatment up to 1250°F.

Brown Boveri Induction Cable

Highly flexible, heat-resistant. For work temperatures up to 1250°F without water cooling. Can be used for preheating then stress relieving without removal during welding. Bends to radii of 2" or less for easy application to the work. Supplied in easy-to-handle sections of 15 to 50 ft. quickly connected during application. Insulated for 1000v.

Write for complete details and Cost Estimate Questionnaire.

BROWN BOVERI

U. S. Sales and Engineering: Brown Boveri Corp., Dept WF12, 19 Rector Street, New York 6, N. Y. Agents in 27 U. S. cities.

For More Information Circle No. 17 on Reader Service Card.

Circle No. 59 on Reader Service Card.

WELDING AND SET-UP PLATENS

MADE IN VARIOUS SIZES TO SUIT YOUR PARTICULAR JOB

Speed-X welding and assembly platens are available in the following sizes: 5' x 5', 6' x 6', 3' x 6', 4' x 8', 3' x 8', 6' x 8', 4' x 4', 6' x 10', 6' x 12'. Precision fabrication to close tolerances requires a perfectly level dogging table for layout, assembly and welding. Speed-X blocks are adaptable to hold down bolts as well as goose neck dogs so they do the work of both bending blocks and T-slot tables. Only Speed-X offers this truly unusual table. A complete line of accessories, including dogs—hold-down bolts—pins, U-clamps, and prefabricated tables also available.

STAHL EQUIPMENT CO.
94 Washington St.
Brookline Village 46, Mass.

REFERENCE DATA *catalogs, handbooks, manuals*

MANUAL TUBE ELECTRODE for hardfacing jobs that require speed and economy is described in a two-page bulletin available from American Manganese Steel Division of American Brake Shoe Co. The new illustrated bulletin includes information and specification of the new Amsco 53 and its uses on crusher rolls, hammermill hammers, dipper teeth and lips and scraper blades and bits. **For More Information Circle No. 75 on Reader Service Card.**

THE ANG-LO-CATOR PROTRACTOR for determining accurate angles for all types of pipe and structural material is described and illustrated in a 4-page folder available from Ang-Lo-Cator, Inc. **For More Information Circle No. 76 on Reader Service Card.**

ROTATING HEAD SAW is illustrated and described in a 2-page, 2-color bulletin available from the Wandsbeker Werkzeug-Gesellschaft Beinhoff & Co. The bulletin lists engineering specifications, prices and uses in both English and German. **For More Information Circle No. 77 on Reader Service Card.**

SPOTWELD FASTENERS, including the new XN Spotweld Nut, are described in Bulletin 595 published by the Ohio Nut and Bolt Company. In addition to complete dimensional information, the bulletin illustrates typical applications for spotweld fasteners and gives recommendations for welding all parts to the most popular metal thicknesses. **For More Information Circle No. 78 on Reader Service Card.**

Flood FIBER GLASS WELDING HELMETS
For Safety, Comfort and Economy

These seamless fiber glass units (of thermo-setting, polyester resin) are compression-molded and stoutly reinforced to afford maximum protection. All are fitted with the new Fit-Rite, snap on, ratchet type headgear—the most comfortable, durable and easiest-to-maintain you can buy, and not more expensive.

No. 51-8F-2H

NEW DESIGN ADVANTAGES

1. Lighter weight for more comfort.
2. A smoother and stronger shell.
3. Easier cleaning and sterilizing.
4. Non-warping moisture-proof construction.
5. Superior resistance to heat.

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Enjoy real savings with Flood's
1000-HOUR COVER LENS
Outlasts 125 glass lenses. Reduces eye fatigue. Safer because shatter-proof.

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See Your Distributor or Write:

Flood Always FINEST QUALITY FAIRLY PRICED

FLOOD SAFETY PRODUCTS CO.
3037 WEST LAKE STREET, CHICAGO 12, ILLINOIS

For More Information Circle No. 25 on Reader Service Card.

IN 1936, MORT CLARK, then Vice-President of the world's largest sign manufacturer, wanted a welded galvanized sign frame. Every welder manufacturer said it couldn't be done . . . Mort Clark did it, received a check and certificate of achievement from the Lincoln Welding Foundation—and

MORT CLARK'S **GALV-WELD** ALLOY ORIGINAL & GENUINE

WAS BORN

The Navy didn't believe, tested it 3384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!

TIME PROVEN — MODESTLY PRICED
WHY EXPERIMENT?

Regalvanizes corrosive seams and areas where galvanizing is burned away by welding, skipped in hot dip galvanizing, or abraded in fabrication.

Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.

Ideal for pipe joints, galvanized structures, water and fuel tanks, duct systems, cold storage lockers, sinks, drains, washers, towers, steel buildings, railings, etc.

Some distributor franchises still available. Cash in on consistent campaign now running in 18 national magazines.

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Send Information User ☐ Distributor ☐
Dealer ☐ Free Sample ☐

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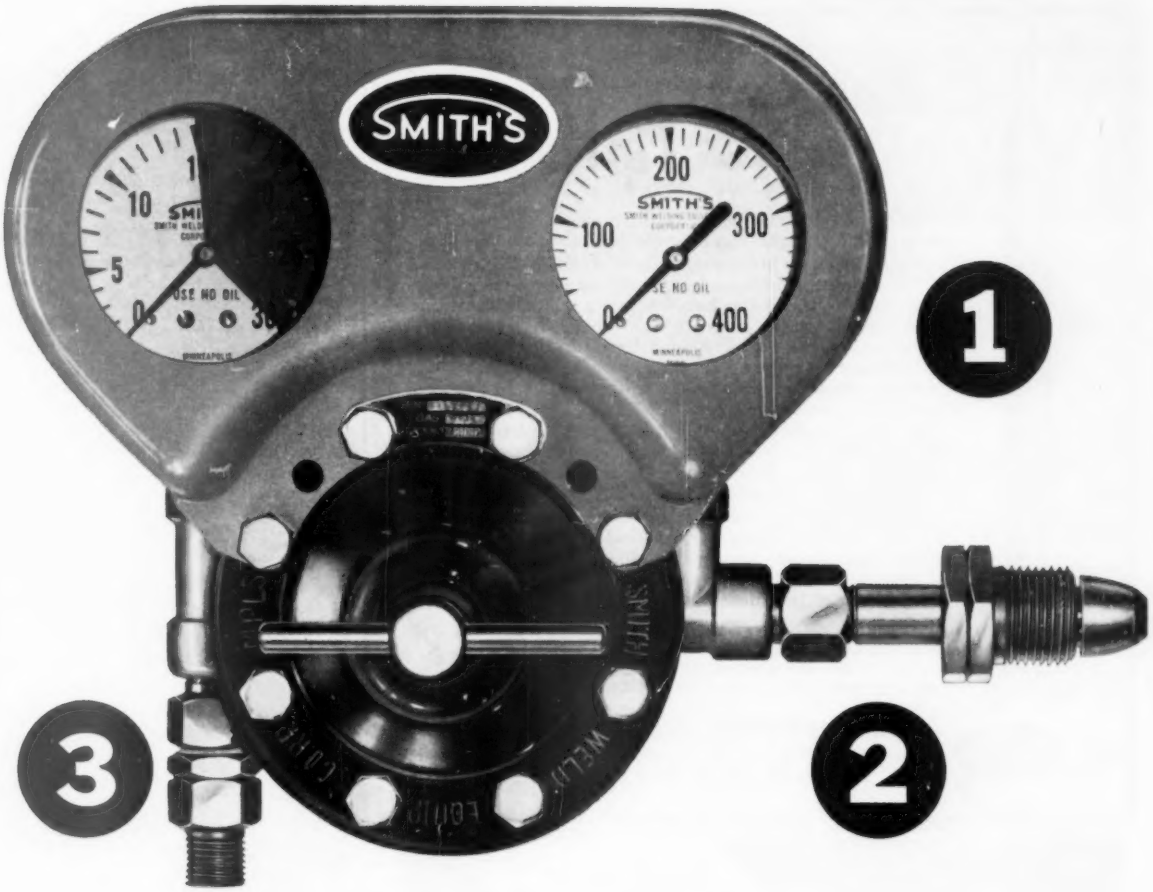

THE WELDING INDUSTRY'S SAFEST REGULATOR... *AND HERE'S WHY*

This is Smith's SAF-T-PAK Regulator* . . . a precision instrument designed for years of rugged, dependable, trouble-free service. It eliminates three of the most common dangers of regulator failure in this way:

1

A Regulator Hard Hat encloses the ordinarily exposed gauges . . . protects the precision mechanism from bumps, knocks and breakage which may impair or stop its function, with resultant gas leakage.

2

A Safety Inlet Connector allows easy replacement of damaged connections without special tools . . . encourages quick repair, resulting in safer use.

3

A Regulator Flo-Trol on the down stream side of the regulator prevents reverse flow and mixture of gases, eliminating one of the explosive dangers in using a regulator.

These three exclusive features, together with 41 years of success of Smith's top quality design and construction, make the SAF-T-PAK Regulator your customer's best investment. He'll be asking for it . . . make sure you have it in stock.

**for oxygen, acetylene and LP gases*

SMITH WELDING EQUIPMENT CORPORATION

2621 *Fourth Street, S.E.* • *Minneapolis, Minnesota*

For More Information Circle No. 57 on Reader Service Card.

For More Information Circle No. 66 on Reader Service Card.

New MUCH IMPROVED TUFFALOY Tip Holders

For long life and ease of maintenance, TUFFALOY Series "E" straight ejector-type holders combine top performance with great simplicity of design.

The entire sturdy brass head, with its attached ejector tube, is forced into the barrel to eject the welding tip. Two rubber water seals prevent leakage. They are placed inside the barrel, hidden from dirt and damage. This design eliminates the small, easily distorted ejector plunger extending through the stationary head of most holders now on the market.

A threaded coupling holds head and barrel together, and permits the head to swivel freely. Loosen the coupling, even without removal from the machine, for inspection and maintenance.

Made in twelve models: barrels are 8" and 12" long, 1", 1¼" and 1½" diameter, and hold No. 1 and No. 2 Morse taper tips in threaded adapters, furnished as part of each holder. Adapters are RWMA class 2 alloy to reduce wear of the tip socket.

TUFFALOY Resistance Welding Alloys are widely available through AIRCO and TUFFALOY representatives. Call on them for Spotwelding Tips (Standard, TUFFCAP, Cold-Bent, and Special), Holders and Adapters, Bar Stock, Forgings, Seam Welding Wheels, and all other welding alloy needs. Ask for Catalog and Price List.

AIRCO

AIR REDUCTION SALES COMPANY
A Division of Air Reduction Co., Inc.
150 East 42nd Street, New York 17, N.Y.

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ALUMINUM
WELDING WIRE
☐ deposits uniformly
☐ eliminates interruptions
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All-State Bright Wire Spoolarc, extruded and precision spooled, is uniformly round, microscopically clean... meets aviation, tankage, and shipbuilding standards.
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Distributor Stocked, convenient to buy. Economical to use.
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Call WHite Plains 8-4646 or write for nearest distributor

For More Information Circle No. 4 on Reader Service Card.

TWO NEW DEVELOPMENTS in safety hats and caps made by Fibre-Metal Products Co. are featured in Bulletin 55. Described in detail and illustrated are dual features: polyethylene suspension and new special-layered fiberglas shell.

Circle No. 81 on Reader Service Card.

"INDUSTRIAL RADIOGRAPHY with Radioisotopes" is the title of a 12-page booklet issued by Picker X-Ray Corp. The illustrated booklet discusses the advantages peculiar to isotopes in radiography, the selection of the proper isotope for a particular job and methods for making radiographic exposures. The booklet contains a "chart of equivalent energies" that shows typical exposure times required to radiograph different thicknesses of different metal with different isotopes.

Circle No. 82 on Reader Service Card.

POCKET GUIDE on gas-shielded metal-arc welding wires is available from Air Reduction Sales Co. The company's 84-page booklet provides convenient answers to every pertinent question concerning steel, aluminum, copper, stainless steel, titanium and special wires used with the company's Aircomatic welding process. Chemical compositions, mechanical properties and operating procedures are given for all wires.

Circle No. 83 on Reader Service Card.

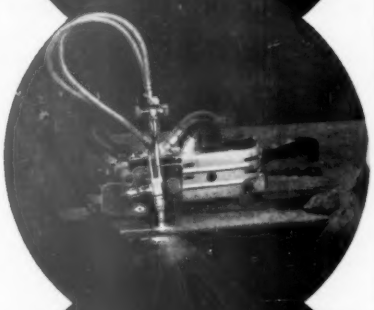
CABLE REEL Model EA-10 is the subject of an illustrated catalog sheet from United Specialties, Inc. Described and illustrated is a dual reel unit which can accommodate 50-feet of 2/0 lead cable and 50-feet of 2/0 ground cable. Hose reel Models A-1 and A-2 are also described and illustrated.

Circle No. 84 on Reader Service Card.

A COMPLETE, NEW CATALOG issued by American Optical Co. features its entire Ultrascopic safety glasses line. Catalog S-8582 contains data on the Safemaster, Mahogany, pink crystal and metal frames.

Circle No. 85 on Reader Service Card.

AT LAST!



REALLY A PORTABLE OXYGEN CUTTING MACHINE

INEXPENSIVE • LIGHTWEIGHT
ECONOMICAL • VERSATILE

The Messer "Quicky" Pays for Itself!

Where can *you* use the new Messer "*Quicky*" cutting machine — now available in the United States for the first time.

The *Quicky* is perfect for cutting plate from ⅛ to 2½ inches. Yet it weighs ONLY 13 POUNDS!

You'll be amazed at the quality of this machine. Yet its low price means you'll get real savings when you use the versatile *Quicky*.

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MESSER CUTTING MACHINES, INC.

WELDING ENGINEERING · Messer · SINCE 1898

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Circle No. 40 on Reader Service Card.

THE MEDICAL DIVISION of National Welding Equipment Co. has just released a new, 20-page illustrated catalog, listing many of its products used by hospitals, ambulance companies and patients in private homes suffering from various respiratory ailments. The new catalog features a complete line of medical regulators, flowmeters, humidifiers, fittings, gagues, masks and cannulas, portable and stationary manifolds, tubings, hospital piping and equipment cylinder trucks.

Circle No. 86 on Reader Service Card.

CONDENSED SPECIFICATIONS are given for all P&H transformer, rectifier and rotary DC welders in a comprehensive 12-page booklet issued by Harnischfeger Corp.

Circle No. 87 on Reader Service Card.

A METAL TREATMENT that conquers rust is featured in a four-page folder from Rusticide Products Co. The folder describes the company's "Ospho" treatment which is applied directly on rusted metal to stop rust action and provide a sound base for regular maintenance paint.

Circle No. 88 on Reader Service Card.

WROUGHT COPPER AND COPPER-BASE ALLOYS are illustrated and described in a 14-page booklet from Western Brass Sales, Metals Division, Olin Mathieson Chemical Corporation. The easy-to-read reference sheet list the nominal composition, available forms and physical properties of alloys.

Circle No. 89 on Reader Service Card.

You give food and friendship with every $1 package you send to the world's hungry thru the CARE Food Crusade, New York

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YOUR Resistance Welding Electrode NEEDS Are OUR Business!

Whether it be:
TIPS:
ROD or BAR:
SEAM WELDING WHEELS:
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CASTINGS:
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ADAPTERS:

SPECIAL WELDING DIES or FIXTURES: TIPALOY *has them.*

BUY TIPALOY and save money!

TIPALOY can supply you with:
RWMA Class #1, Tipaloy #100
RWMA Class #2, Tipaloy #130*
RWMA Class #3, Tipaloy #200
and other RWMA classes of alloys to fit your needs.

It is unwise to pay too much, but it is worse to pay too little!

Use TIPALOY and get 30% to 100% more performance for your money than you are now getting.

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*TIPALOY #130 cast and processed under our patents.

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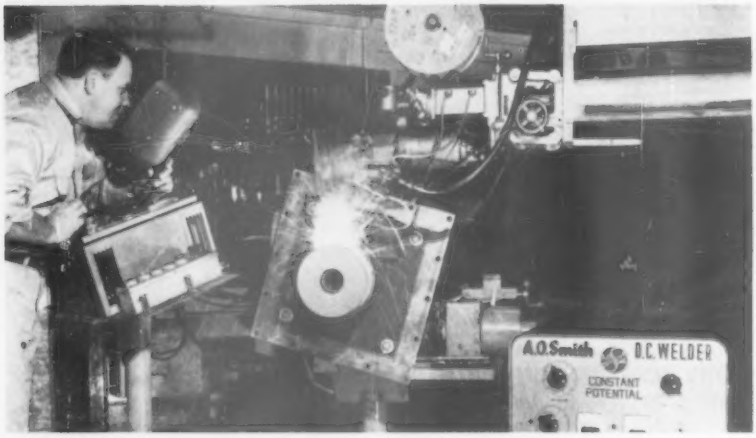
NEW PRODUCTS



Automatic CO_2 Welder For High-Speed Production

CP C-OMatic, a new CO_2 automatic welding equipment package introduced by A. O. Smith Corporation's Welding Products Division, is designed for high-speed production. The unit provides high-quality weld metal, high deposition rate, deep penetration, low-hydrogen weld metal, visible arc and no slag removal. Basic major components consist of a 600-ampere constant-potential power source, electronic control panel, automatic welding head, nozzle and three-position mount.

The welding head is designed for rugged duty and provides high-torque power required to drive weld wire smoothly and without interruption. Wire speeds from 55 to 1200 inches per minute are possible.

Circle No. 100 on Reader Service Card.

New Coated Abrasive

A new line of resin-bonded aluminum oxide coated abrasives with a sharpness and cutting life never before attained has been developed in the laboratories of Behr-Manning Co., a division of Norton Company.

Marketed as Metalite Type 101, the new abrasive is available on fiber discs and cloth belts, both characterized by a uniform and attractive brown color.

A modification of the Type 101 abrasive, labeled 101T and applied to fiber discs in the grit range from 24 to 60 inclusive, has proved particularly effective on stainless steel, brass, bronze and other alloys, where increased abrasive life is accompanied by a marked freedom from heating and resultant discoloration of the metal. Throughout, the Type 101 abrasive is said to exhibit extreme

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Company_____

Street_____

City_____ Zone____ State_____

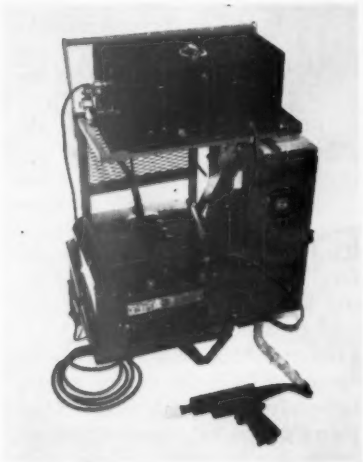
WDF-1259

For More Information Circle No. 72 on Reader Service Card.

sharpness which is sustained even in rigorous service. This fast-cutting behavior, whenever present in a coated abrasive, is accompanied by cool cutting. The new material also gains in durability by keeping shedding to a minimum.

The Metalite Type 101 fiber discs are made in a grit range from 150 through 24; belts from 180 through 24.

Circle No. 101 on Reader Service Card.



Spot Control Unit

Now available from Tec Torch Co., Inc., is this completely portable spot control unit which consists of a Tec spot gun, spot control panel, high frequency unit and heavy-duty contactor mounted to a heavy-duty frame truck. This unit makes Tec spot welding accessible at the point of work by adding a DC power source.

Circle No. 102 on Reader Service Card.

Coiled Tube Rods For Open Arc Welding

Haynes Stellite Company, Division of Union Carbide Corporation, announces that copper-coated tube rods are now available for semi-automatic open-arc hardfacing. "Haynes" 90, 94, and 4560; "Haynes" Nickel-Manganese; "Hascrome;" and "Haystellite" tube rods are all supplied in the 7/64-inch dia. drawn size, in convenient coils. The tube rod contains an internal flux to make open-arc deposition possible and insure a sound, slag-free deposit.

Circle No. 103 on Reader Service Card.

For More Information Circle No. 60 on Reader Service Card.

QUICK way to cut downtime!
ECONOMICAL, too!

REBUILD
Worn Tractor Grousers
with
SS HI-C
TRACTOR GROUSER BARS
SPECIAL ANALYSIS HIGH CARBON STEEL

Attaches quickly with any good grade of low hydrogen electrode.

Easy to attach with any manual or automatic electric welding method.

Write for complete details and nearest distributor.

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SOLE PRODUCERS

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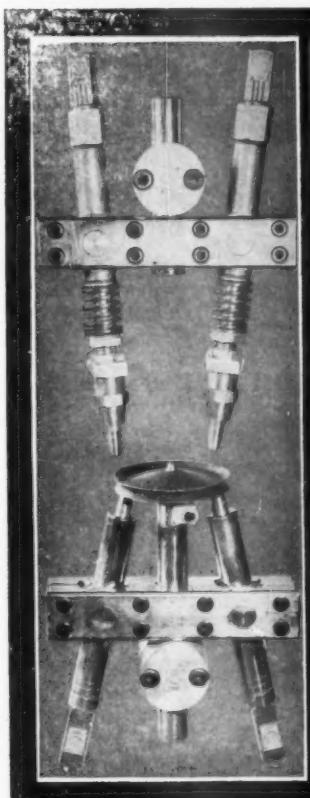

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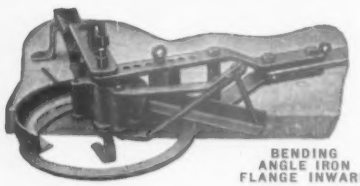

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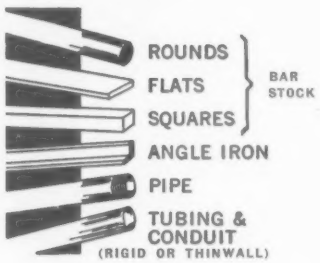

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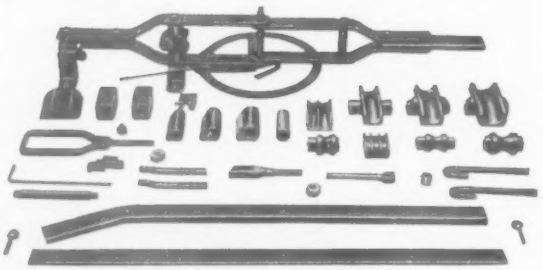

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New Valving Machine

Independent Engineering Company, manufacturer of the Model "200" valving machine, has added a new model and new type "Slip-on Inserts" for the valve wrench.

The new valving machine, Model "200BE", features an automatic electric control for the valve wrench drive. When the torque, applied by the valve wrench to valve being inserted, reaches a predetermined setting, a control stops the valve wrench and automatically inserts all valves to a uniform leak-proof tightness.

The new "Slip-on Inserts" can be changed quickly for valving of different size cylinder valves when group sizing is not practical. The exchange can be made without tools or interruption of valving procedures and are interchangeable in the valve wrenches of the earlier model "200" valving machine.

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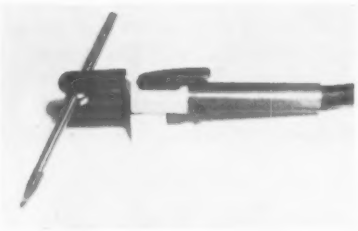

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The H-55 torch is a heavy duty model for industries whose work requires air on both sides of the electrode.

An outstanding improvement on the Model H-55 is the push button air control valve in the torch handle. Either ½" or ⅝" diameter electrodes can be used. It is heavily insulated to guarantee long, maintenance-free service.

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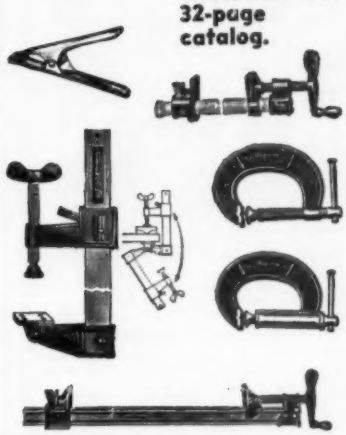

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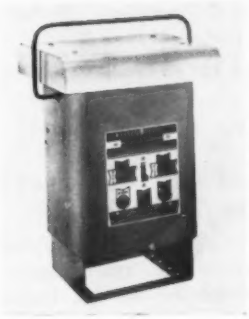

205 Amp AC Welder

A new, light weight (70 lb.), low cost, hand portable, 205 amp, heavy duty welder (one-fourth the size of any welder of comparable amp output) suitable for production welding or tacking, is now being manufactured by Emerson Electric Mfg. Co.

The new Emerson Electric Portarc 205 is designed for all industrial and commercial applications that require manual welding. It has a full 60% duty cycle plus an 80 open circuit voltage from six conveniently located, 135 thru 205 amp, heat taps. A low open circuit voltage feature is optional on the 230V or 460V models.

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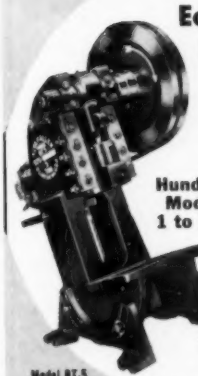

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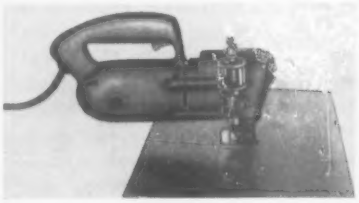

Portable Nibbler Is Self-Oiling

Modern Manufacturing Company's portable nibbler is now available with a self-oiling lubricator. The nibbler, which cuts stainless steel up to 10 gage, will operate with greater ease and prevent wear and tear on punch and die when the automatic lubricator is used.

An adjustment on the dispenser allows oil to drop at desired intervals depending upon the density of oil used.

By using a lubricator, the nibbler will cut faster without burrs and make a more even edge when cutting 10 gage or 8 gage material.

Two models of the lubricator are available for various nibblers now on the market.

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Natural Gas and Propane Cutting Tips

A new line of tips for flame-cutting with natural gas and propane has been announced by Air Reduction Sales Company. Designated style 260 and style 360, these new tips were designed to be used with standard Airco 3000 and 9000 hand cutting torches, 3700 and 3800 hand cutting attachments and 4700 machine cutting torches without any additional accessories.

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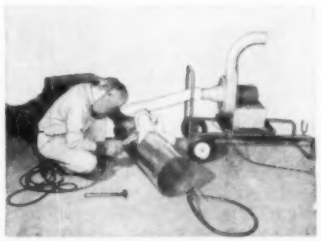

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In contrast, carbon-arc and inert-gas tungsten-arc welding offer easy control and eliminate slag and spatter. When these processes are used with a copper-alloy filler rod, such as Everdur-1010, control is greatly improved because Everdur's lower melting point produces bonding with only minimum melting of the steel. Increased welding speeds and the narrow heat-affected zones mean reduced distortion. Joint properties are adequate for all but the most exacting applications.

The narrow heat-affected zones make these processes attractive also for welding galvanized steel because they cause the least possible disruption of the protective zinc coating. With non-rusting copper-alloy welding rods they make the most dependable joints possible. So, Everdur-1010 has become a favorite filler metal for use with these processes in the fabrication of galvanized structural elements, ducts, and various types of container.

WELDING AIR-CONDITIONING DUCT SYSTEM FITTINGS at Carrier Corporation's plant in Philadelphia, using the carbon-arc process, with Everdur-1010 Welding Rod.

Carrier Corporation is one of the many concerns that utilize these advantages in their manufacturing operations. For many years, fittings and other components of their air-conditioning duct systems have been produced with ease and economy by welding with the carbon arc and Everdur-1010 Welding Rod.

Best results in welding either plain or galvanized steel require that only the least possible amount of steel be melted. To insure this it is necessary to avoid weaving so as to keep the arc always on the bronze weld metal. Arc lengths are kept as short as possible and current values set low enough to require welding speeds that can be handled with ease.

Joint types usually employed in sheet metal work—square butt, lapped, edge, and corner welds—are suitable for use with these processes.

Free Technical Service. If you have questions regarding the possible application of these processes to your job, Anaconda specialists will gladly help with suggestions. For such help or a copy of Publication B-13 write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

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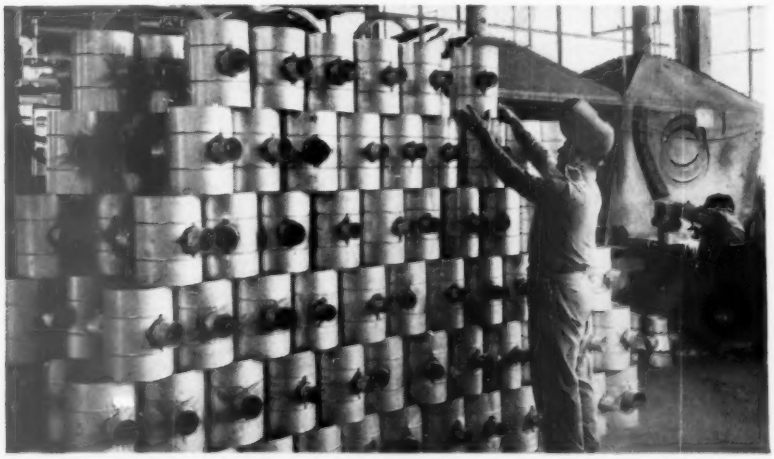

ANOTHER VIEW OF AREA devoted to welding Carrier duct system components.

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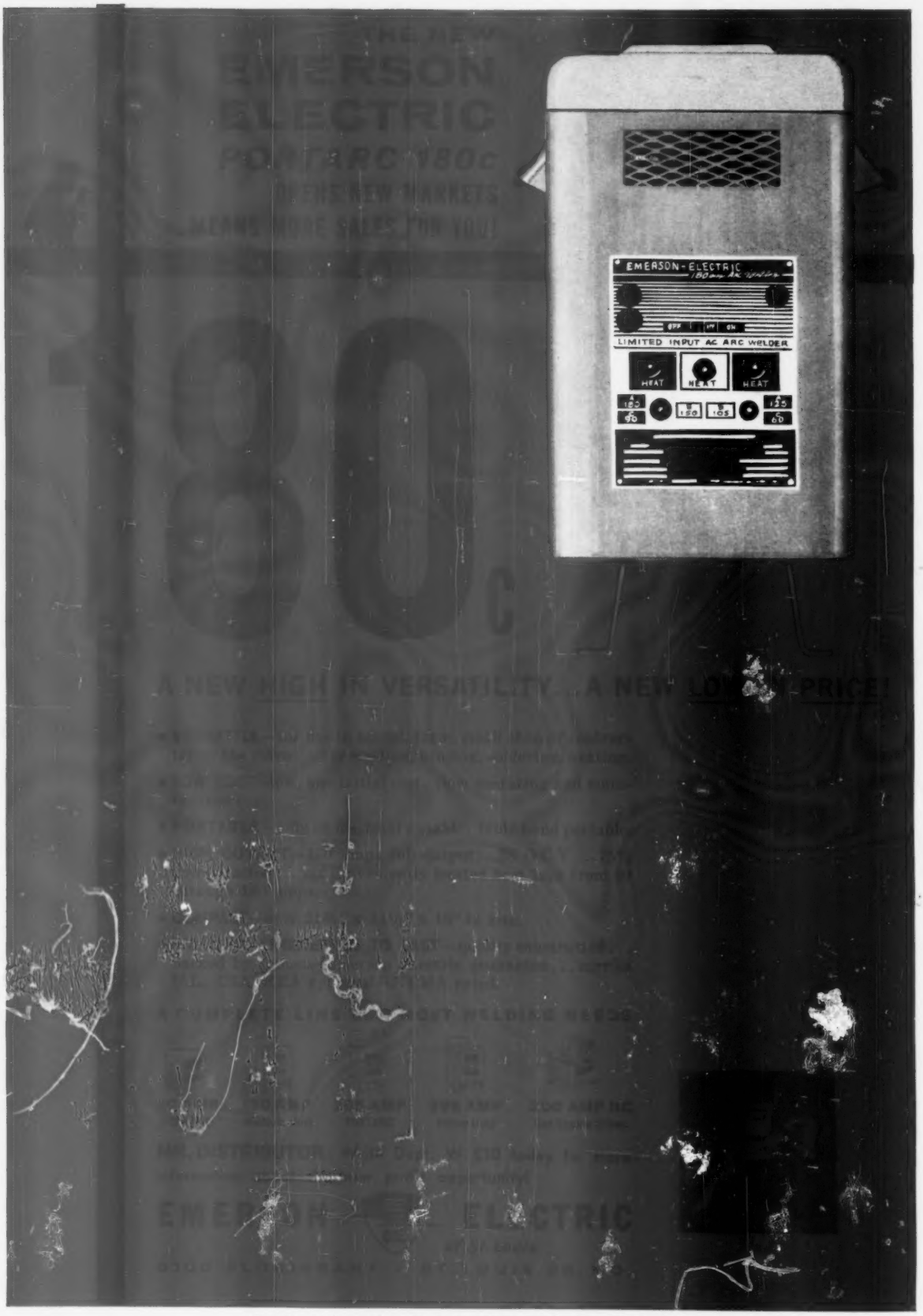

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